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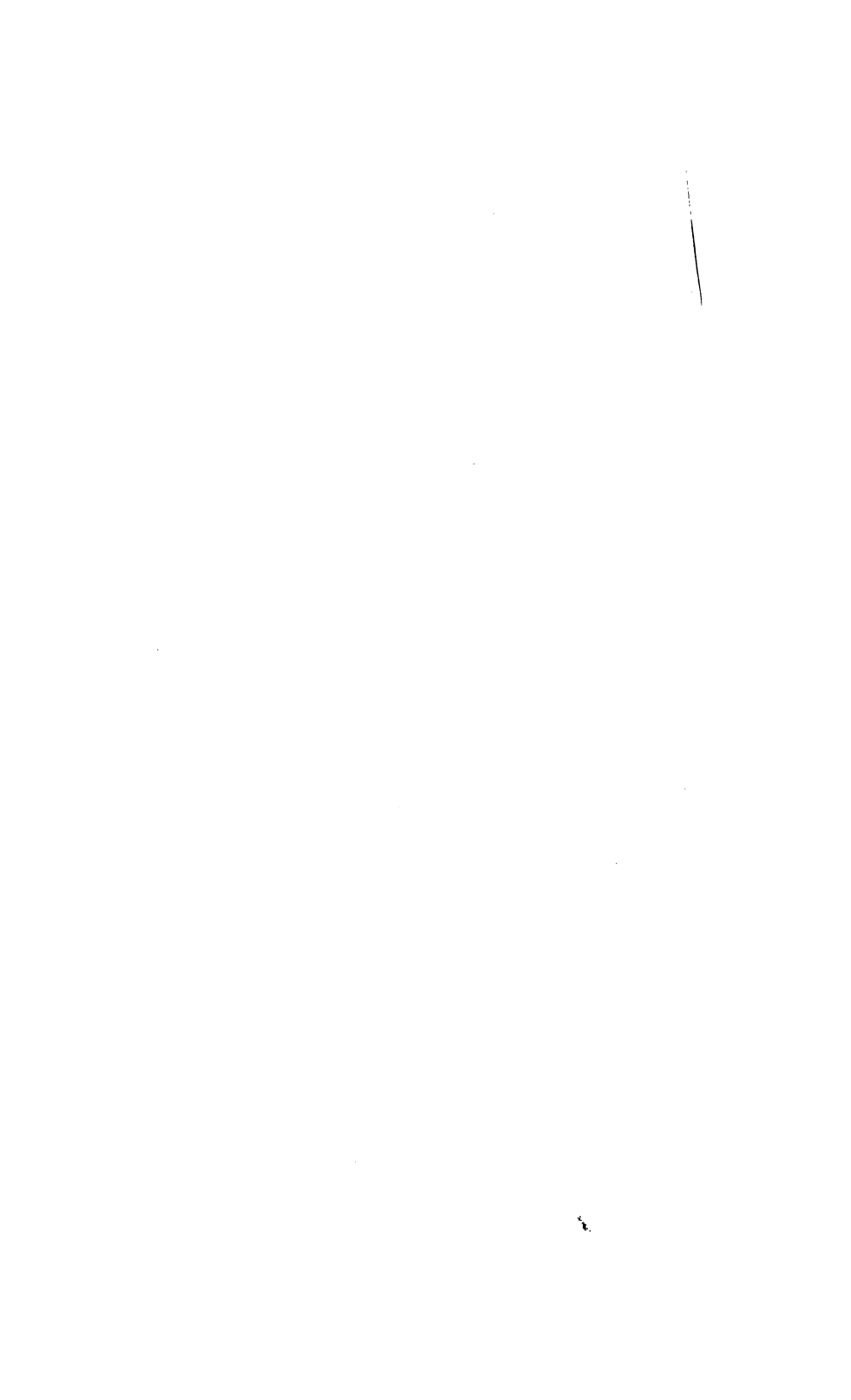
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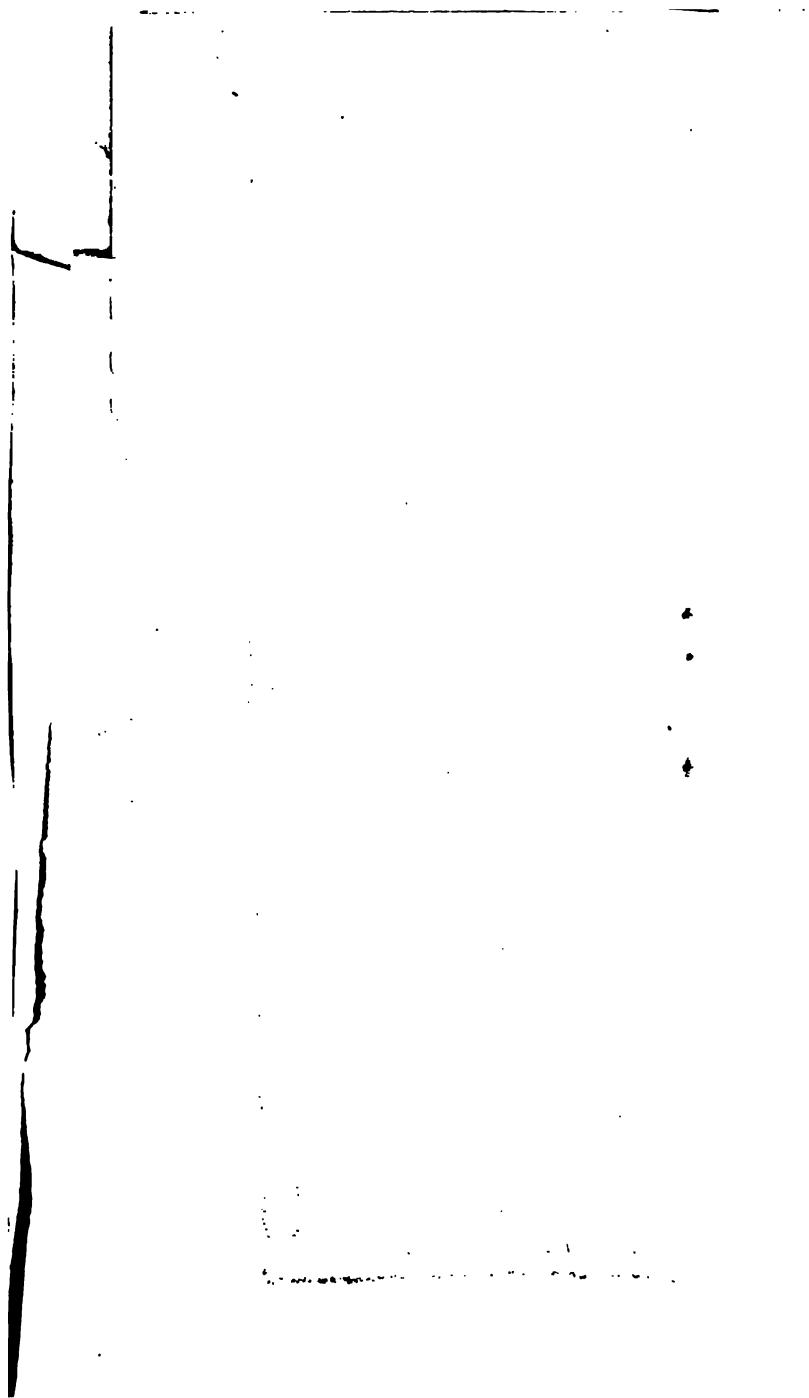
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THE ISTHMUS OF DARIEN
IN 1852.

JOURNAL
OF THE
EXPEDITION OF INQUIRY
FOR THE
JUNCTION
OF THE
ATLANTIC AND PACIFIC OCEANS.

BY
LIONEL GISBORNE.

WITH FOUR MAPS.

LONDON:
SAUNDERS AND STANFORD, 6, CHARING CROSS.
1853.

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JOURNAL.

ON the 2nd of April, 1852, the Royal Mail Steam Company's Ship 'Great Western' left Southampton with sixty passengers, among whom Forde and I were bound for the Isthmus of Darien, to examine into the possibility of making a ship navigation across it, so as to join the Atlantic and Pacific Oceans. This project has for many years occupied the attention of mercantile nations, the narrowness of the Isthmus generally known as that of Central America, and the importance of the western coast of this continent, having induced the Spanish Government, as far back as the 16th century, to make inquiries into the feasibility of such an undertaking. Engineering was then a work of labour unassisted by science or experience, and the requirements of commerce were not sufficient to induce private enterprise to attempt single-handed what govern-

ments were unsuccessful in maturing. Since that time Spain has been too much occupied with internecine disturbances, and the difficulty of retaining her Western possessions, to take advantage of her position, and encourage commerce in a liberal spirit. All her acts were governed by a strict adherence to a selfish policy, aiming at a monopoly in the trade of such articles as her new colonies afforded. A golden reign followed, but it was of short duration—as all such systems of commerce must be—and the reaction caused not only the loss of nearly all the realised wealth, but was followed by the separation of the colonies from the mother country.

Nor was this separation effected simultaneously, to consolidate a new power in the Western world which could command its own possessions and extend its influence. Petty squabbles and a grasping local government have caused revolution after revolution, until at last speculation itself was cowed at the uncertainty of its tenure in a land teeming with riches; and these states have been left the monopoly they so much desired—left struggling with a form of government, or rather a succession of revolutionary reactions, without any secure foundation to enhance their prosperity, or advance them in civilization.

At the present moment Central America consists of several states, having each an independent govern-



ment, and living on the most unneighbourly terms. This disunion has retarded the complete subjugation of the Indian tribes, and left large tracts of the country almost unknown. Such is particularly the case with the Isthmus of Darien, which for the last century and a half has been completely abandoned to the Aborigines. Of the interior of this country nothing is known, the direction of the principal rivers and the elevations of the mountain ranges being quite hypothetical. During my stay in London I consulted members of the Geographical and Geological Societies, and the answer I invariably got was, "We know nothing definite—nothing that we can give you as a *fact*—we must look to you to supply us with the information you come to obtain." The reasons generally given for this lack of knowledge is the difficulty of visiting the country, the climate, incessant rains, and the savage state of the Indian tribes—all combining to render the entry difficult, and the return still more so. To these must be added the usual obstructions of an unexplored district, such as impenetrable woods, swamps, rivers, mountains, snakes, wild beasts, &c. &c. Of these, however, I trust to be able to give a more detailed account, should it please Providence to allow of my return.

There can be no doubt that both Spaniards and

Indians often created difficulties to dissuade others from judging for themselves—the former in carrying out those selfish views of monopoly by which they hoped to be enriched, and the latter by the bitter recollection of the cruelties their ancestors suffered from their conquerors. In the 16th century might was right—a conqueror was an autocrat, responsible to no one for his acts, and encouraged by his Home government to oppress and plunder those he had dispossessed of their natural territory. A fearful history of rapine and cruelty is given by all the old historians of the conquest of this portion of America, and I regret to say, that among the Buccaneers or pirates of the 16th century, the English held a most prominent and unenviable part. These pirates, not content with pillaging and sacking all the towns and villages on the then called North Sea (Carribean Sea), used to make frequent inroads into the interior, and in some instances crossed the Isthmus, and carried on their depredations into the South or Pacific Ocean. Their history, as recorded by several of themselves, and translated into English in 1741, affords the only authentic information as to the Isthmus of Darien. It was crossed several times by them, the Indians in most instances acting as their guides, either voluntarily or by compulsion; but after carefully reading these excursions, and those

related by Wafer, I feel satisfied that in no case did they take the nearest or lowest route between the two oceans. They generally moved in large bodies of from 100 to 400 men, having to procure their subsistence on the way, so that they shaped their course to the points where provision was to be got, and where the Indians had made paths or provided canoes. It is remarkable also that in no case did any party go and return by the same route, the authors themselves laying down this circumstance to the cunning of the Indians, who purposely misled them, so as to prevent any inroad upon themselves.

I shall not now enter into any details respecting these adventures, reserving any points of interest for relation in conjunction with my own personal observation of the locality. I shall, however, give a short summary of all the projects which have been before the public for effecting a communication between the two seas, whether by road, railway, or canal, and then state what my own special mission is, and how it originated. There will, I fear, be great incongruity and disconnexion in the manner I discuss the whole subject. At some future time I trust to arrange and cull from my notes what may be of permanent interest to the public. My present intention is to keep a journal of events, and ideas

dependent on them, thrown together at the time, and probably with very little consideration, not binding myself to the monotony of a diary, or to the relation of circumstances of every-day occurrence, which would swell the volume without adding to its interest or worth.

In Vol. XX. of the Geographical Society's Journal, Captain Fitzroy has collected all the information relative to the various inter-oceanic routes proposed, and the difficulties connected with their execution. The following is a summary of his paper on the subject:—

Four principal lines have been hitherto recommended, to which may now be added three more.

1st. The *Mexican line*, to connect the Gulf of Mexico and Tehuantepec.

2nd. The *Nicaragua line*, to form a navigation up the river St. Juan to Nicaragua Lake, and from thence to some port on the Pacific, of which no less than six have been named as eligible.

3rd. The *Panama line*, from Chagres to Panama.

4th. The *Atrato line*, to form a water communication between the river Atrato and Cupica Bay on the Pacific.

The three other lines lately brought into notice are—

From the Chiriqui Lake to Dolce Gulf.

From St. Blas or Mandingo to Chepo in the Bay of Panama.

And from Port Escoces near the Bay of Calidonia to the Gulf of St. Miguel on the Pacific.

This last route is the one I am specially sent to examine and report upon. It is not to be supposed that because all these projects have been before the public (and some of them have Companies in existence to carry them out), that they have been carefully examined by professional men, and recommended after mature and carefully digested information as to the difficulties to be overcome, the capabilities of the country to furnish the necessary material in their construction, and all the contingencies especially to be anticipated where climate, nature, and aborigines all combine against the practice of engineering as carried out in the Old World; on the contrary, no such detailed information has been obtained, or where it has been attempted to be given the facts have generally been contradicted by experience, when the works were commenced. The Panama Company have executed a few miles of railway and expended their capital, a mule road forming their present connection between the oceans. The Americans have lately made detailed surveys of the river St. Juan and the Nicaragua line, and Col. Childs, their engineer, has, I understand, reported

most favourably on the feasibility of a ship navigation. I cannot, of course, contradict this assertion, or call into question his views, not having examined the line or read his reports; but I think that the general facts of the case, which have been more than once examined into, and are, I believe, in the main correct, are not such as to impress one with a favourable idea of this project.*

The river St. Juan debouches into St. Juan or Greytown Harbour, a chart of which is now before me, the soundings having been taken in 1848 by Mr. Wheeler, R.N., of Her Majesty's Ship Alarm.

The harbour itself is fairly protected by a spit of land running two-thirds across, and inside the anchorage is good with from 4 to $4\frac{1}{2}$ fathoms of water. The river St. Juan debouches into it through two mouths, one of which Mr. Baily in his work on Central America recommends should be closed,† as it at present brings down large quantities of sand and other detritus, rendering the entrance into either mouth always shallow and dangerous. I have obtained a good deal of information from a gentleman‡ who accompanied Capt. Lock in 1848 to Nicaragua Lake, when the expedition was formed to protect

* Since this was written Col. Childs' report has been published, and proves the practicability of this route for a small class of Navigation.

† Page 135.

‡ Staff Surgeon Le Blanc.

some of the Mosquito territory from encroachments by the state of Nicaragua. The expedition consisted of eight boats, the largest of which, the pinnace, was coppered, and when laden drew $3\frac{1}{2}$ feet of water. This boat could only be got into the river when empty, or nearly so, and the other boats were constantly running on sand banks, the position of which was always changing; besides which, the land at the mouth of the river is very low and full of lagoons, the position of the sand banks in the harbour itself being dependent on the state of the river water.

After thirteen days voyaging the boats reached Nicaragua Lake, the pinnace having often to be unloaded, and the boats tracked or poled up rapids. The distance is about 104 miles, so that the average rate per day was only 8 miles. This voyage, undertaken by English seamen in *frigate boats*, speaks for itself as to the difficulties to be overcome to make this river capable of being navigated by vessels of from 2000 to 3000 tons burden; but Nicaragua Lake is only 125 feet above the sea,* and the summit between it and the Pacific is 615† feet,‡ through which it is proposed to make a tunnel 5,831 yards long, ($3\frac{1}{2}$ miles nearly,) 121 feet high, and 96 feet

* Capt. Fitzroy, page 169.

† Baily, page 142.

‡ This has since been contradicted, and it is stated the summit is only 48 feet.

wide; the cost of which is estimated at one and a half, or two millions sterling. On calculating the section, I find it comes to about 3*s.* a cubic yard, without any allowance for shafts. The material I presume to be igneous rock, the Cordilleras being known to be such, but should a loose material be encountered, and arching become necessary, I do not think three times that sum will suffice. Fancy a continuous arch 96 feet span, springing from abutments, at least 100 feet high, and 3½ miles long, supporting overhead from 300 to 400 feet deep of earth. Supposing, however, this tunnel excavated, how could ships pass into it with safety without any light to guide them in their course, should even such a course be straight? A few shafts may throw a glimmer of sunshine here and there, or extensive gas works may convert this subterranean passage into an illuminated cave; but I fear very much that both shareholders and mariners would sooner face the Straits of Magellan, when experience had once proved the cost and the danger. From this tunnel to the nearest Pacific port (St. Juan del Sur) is under four miles;* with a fall of 283 feet from water to water, or allowing 15 feet fall to each lock, 19 locks must be made in that short distance. As there is no

* Baily's Map, published by Trelawny Saunders, 6, Charing Cross, London.

river of any importance in that reach, Capt. Fitzroy very properly remarks that "how a supply of water for this canal could be obtained is a matter of mere conjecture."* "The Harbour of St Juan del Sur," says Capt. Fitzroy,† "is too small and too much exposed to the ocean to be of constant service; it is but five cables across, which is only just room for a steamer to turn with facility (without reference to other vessels on the beach). It is exposed to the ocean swell, and to winds, which are there very violent." Mr. Baily suggests a junction between this harbour and Nacascolo, by a canal about a mile in length; but what advantages this would offer he does not say. Thus the shortest Nicaragua route by the river St. Juan is about 150 miles in length, requiring at least 36 locks, a tunnel from 3 to 3½ miles in length, and extensive harbour works at one end at least (St. Juan del Sur).

Col. Childs may alter the design, and place more practical views before the public, but still the *distance*, the *summit level*, and the *want of harbour room*, must be overcome, and overcome in a country particularly antagonistic to engineering operations.

Mr. Baily and others have paid considerable attention to the Panama route, but as the Company

* Geographical Journal, page 171, vol. 20. † Ditto, page 169.

have determined on executing a railroad in preference to a water communication, a concession of the land having been granted to them for this object, I do not think it necessary to discuss such a project here. Should I visit the place before my return, which is not unlikely, I can give the result of my observations.

The Mexican line may be said to have been abandoned as a canal, having neither geographical position nor any peculiar facilities to recommend it.

The Atrato line to Cupica Bay requires to be further examined into before any definite opinion can be given as to its advantages. The distance, 114 miles, is in my mind an insuperable objection; for although the Atrato may, with a depth of 8 or 10 feet of water, not offer any difficulty to the navigation of a class of vessels adapted to such a draught, yet when increased to 25 feet, the fall per mile will be so much reduced on the surface, that falls or rapids will be formed, which must be surmounted by locks, and which falls are now spread over several miles of water-course. Without a very large supply of water I doubt much whether the scour would be sufficient to keep up that depth of water with anything approaching to an uniform current. This project holds out one excellent inducement in the superiority of the harbours at each end; and I quite agree with Captain Fitzroy that it is preferable to the Nicaragua route,

as far as present information can lead to any conclusion.

The country between Panama and the river Atrato may be said to be wholly unexplored. The only authentic account is given by the Buccaneers, but it is so vague and so devoid of any certain data by which their route could be laid down on a map, that little dependence can be placed upon their descriptions. One thing, however, appears certain, that there is more than one place in this uncivilised tract where inquiry is likely to be rewarded with success; and the great Humboldt himself, after devoting his time to the study of Central America, for half a century, felt thoroughly satisfied that the Isthmus of Darien is superior to any portion of the entire neck for a canal. Several travellers have failed in their attempts to examine this Isthmus, in consequence of the opposition they experienced from the natives; some lost their lives, and only one professes to have crossed from the Gulf of St. Miguel to Port Escoces,* and it is upon his representations that parties in England determined to make a further examination, and obtain an accurate and unbiassed report upon the difficulties to be surmounted. Such is my mission; and if poisoned arrows or tertian fever do not

* Dr. Cullen, who first brought to England any positive information about this route.

prevent me, I fully expect to solve this great problem, either *pro* or *con*, by a careful examination of every locality where there exists any probability of success.

Port Escoces, or Scotch Harbour, is so called from having been in 1695 colonised by a number of Scotch emigrants, who settled there from the inducements offered by an excellent harbour, a fertile soil, a salubrious climate (in the interior), and the prospect of rich gold mines. Their attempts to form a permanent settlement failed through the want of security from Buccaneers and Indians, and the jealousy of the Spaniards. A history of their exertions has been published,* and affords a melancholy picture of energy and determination, frustrated by local mismanagement and petty jealousies. Their historian does not appear to impute this failure to any misrepresentations as to the richness and fertility of both agricultural and mineral produce; on the contrary, these inducements were so great that a second attempt was made to colonise this district, but failed again through the same causes. On the river Savannah (or St. Martha) a prosperous town existed in the sixteenth century, inhabited by Spaniards and Indians, and accessible to boats of considerable burthen from the Gulf of St. Miguel. The neighbouring tribes of Indians seem never to have been

* History of Calidonia, or the Scots Colony in Darien.

completely subjugated, and committed constant depredations, particular on the gold-seekers, and at last they induced the Buccaneers to burn and pillage the city, having since then undisturbed possession of the whole country. There can be no doubt that during the time the Spaniards held their ground the Indian tribes were treated by them like wild beasts, both their life and property being at the will of the conquerors; unheard of atrocities were constantly perpetrated, the Buccaneers themselves speaking with horror of the cruelties they were witnesses to. When civilisation stooped to such acts, is it to be wondered that barbarism should take ample revenge? and such is the case. The white man is looked upon as a common enemy, and his death is the glory of his murderer, a peculiar distinctive mark of colour being awarded him as a recompence. One hundred and sixty years have not wiped out the stain left behind it by Spanish cupidity, nor will mistrust and revenge be easily alienated from uneducated minds, who look upon indolence and independence of action, as the acme of happiness, without any fear of future punishment or the hope of future reward.

The Gulf of St. Miguel has been lately surveyed by Captain Kellett, R.N., and the chart is now in the hands of the Admiralty Hydrographer. It is much to be regretted, however, that the entrance

only has been laid down and sounded, so that one of my first operations will be to complete the interior. There is every prospect of finding all the requisites of a safe and convenient harbour, unassisted by artificial works, but of this I must satisfy myself before my return. Several rivers debouch into this Gulf—the Congo, Savannah or Santa Maria, and the Darien or Rio Grande; there is no satisfactory information even as to the general course of these inland waters, and it appears probable that their direction as generally laid down in atlases is quite incorrect, a wrong source being attributed to some of them. Dr. Cullen, who examined the Savannah river (and from whom at Cartagena I hope to get an account of his original expedition), fixes its course nearly across the Isthmus for twenty miles, turning then north, whereas in all the published maps, the Chuquanaque runs nearly parallel to the Atlantic coast, overlapping Port Escoces, several miles. I anticipate that the source attributed to the Chuquanaque is really that of the Savannah, the two rivers running at right angles to each other, until the Savannah assumes a northerly direction, otherwise the Andes must bifork at this point, having one valley considerably higher than the other, until the two summits assimilate at the Darien river. Of the Congo river nothing is known, it is probably

unimportant either in size or as an adjunct to the present inquiry. Captain Fitzroy states, that Mr. Wheelwright and Mr. Hopkins were prevented by the Indians exploring the Chepo river, to San Blas and Mandingo Bay, and Dr. Cullen was stopped on the Paya that runs from the mouth of the Atrato to the Darien. He gives rather a discouraging account of these failures; it was verified to me by a passenger on board, who told me the British Consul at Panama mentioned the circumstance to him last year. I have not come across any authentic story of loss of life in these expeditions, so that the difficulties may have been exaggerated by the relators, or, what is more probable, the guides that accompanied them may have sought their own security under a tale of horrors which existed chiefly in their own imagination. It will be time for me to return when the Indians have given any of my party practical proofs of their hostility, and I shall take very good care that my guides shall not desert me without trying the range of my rifle and my skill as a marksman; not that I wish to act harshly or cruelly, but as they will accompany me with full knowledge of the danger, and that, of course, such danger will be an item in the account of their remuneration, I have no idea they should shrink from their duty towards me. I do not, however, expect to have any

occasion for violence ; my chief hope rests upon the conciliatory effect of pipes, tobacco, trinkets, knives, nails, &c., of which I shall procure a good supply at Cartagena, and barter them for good opinion and native protection.

Yesterday morning, (Sunday, April 18) we were informed that a little stranger had made its appearance during the dead hours of the night. It was pronounced, as usual, to be very pretty, with all the personal charms of both parents ; I am no judge, but certainly if it is a beautiful babe, I would give something to see an ugly one. I was surprised to see its eyes open, having hitherto held the barbarous opinion that like puppies and cats such little creatures were doomed to nine days of darkness ; I unfortunately expressed this belief in presence of the father and aunt, who looked as if I was only fit company for cannibal Indians,—and I fear, should I be made a meal of, they will give the verdict of the Irish jury in a case of assault, “served him right.”—“On dit” that a cooked monkey looks very like a new-born babe ; if it is so, my appetite must have the edge of a razor to submit to such a meal ; however, necessity has no law ; but I wish I had not seen this real baby, its reality will be present to my mind when I would as soon ignore it. Forde went through the correct form of kissing and eulogizing its size, making a

lucky hit at expressing his astonishment it should be born with hair ; this I understand is the real proof of a pocket Samson, and created a most favourable impression among the matrons and those who looked forward to be so at some future time. I shall take care to remind him of this, the first tête-a-tête we have at “singe au naturel.” A steamer is certainly the most gormandising place I was ever caged in—at breakfast and dinner each dish is tasted and discussed in every language, ending generally in an appeal to the French cook, with directions for new entremêts, œufs glacés, and the most unheard of and unpronounceable names. I take a wicked pleasure in encouraging my neighbour (a German) to eat of every dish, and, as he most religiously appears at breakfast, lunch, dinner, and tea, (with meat at all meals), he often complains of want of appetite and indigestion—I am surprised he escapes with such minor grievances.

We are to-day (April 19, at noon) 760 miles from St. Thomas, with every probability of running short of coal, continual headwinds having kept us going at 5 and 6 knots an hour, instead of 9 or 10. The trade winds have not yet favoured us, and I begin to doubt of their constancy, if not of their existence; the weather is, however, beautiful, and with an awning over the deck, the heat is not yet unpleasant. Last

night a number of us sat on deck until half-past ten, and enjoyed a cool breeze, making Venus, Jupiter, Sirius, and the Southern Cross, the subject of telescopic observations. Venus is certainly most brilliant, and can justly be compared to a little moon—she dipped below the horizon about an hour after Jupiter had emerged from it.

I have just been informed by one of the passengers, that the American and Mexican Governments have determined to construct a railway from the Gulf of Campeché to the Gulf of Tuantepeque as the high road to California, and that the necessary surveys are completed. This route can only be of local benefit, as it is out of the direct course of vessels from Europe to Australia or China; it may, however, be of service to expedite passenger and light goods traffic, by establishing steam communication to Australia, should no more southern route be found possible with a moderate outlay.

If Darien Isthmus does not offer insuperable difficulties, or the Nicaragua scheme be made practicable, in a few years we may expect to see this connecting link between North and South America crossed by three routes, the Mexican and Panama railways, and the Darien or Nicaragua canal. What a change this will make in Central America; it will be curious to watch the strides of civilization and

commerce, and the development of those natural advantages which all writers on the country agree in believing to exist, although few of them point out definitely the locale of these riches. Mexico is already taking the lead in internal improvement, she has joined the United States in the Campeché and Tuantepeque Railway, and a project is now on foot to connect their capital and Vera Cruz by a railway. I have had an invitation to examine its feasibility, and report upon it; it is not improbable I may do so before my return. The distance is about 300 miles, and the Rocky Mountains offer an almost insurmountable barrier to the construction of a line capable of being worked by locomotives for the whole length. At present a very good road exists, and the diligence carries the mails in three days. The Mexicans have from a very early period shewn a disposition and aptitude to construct engineering works. The Deságue Canal is the largest hydraulic work in existence, although it has been executed nearly three centuries. If I remember right, it is a cut 300 feet wide, having, for two miles nearly 200 feet depth, and all through igneous rock. The object was to drain a lake lying above the town of Mexico, and threatening it with inundation during the rainy season. Should I visit Mexico, I shall certainly not omit making a personal examination of this wonder of the western world.

I have just read a paper on the Isthmus of Panama, published in Chambers' Information for the People. It is worth perusal, and gives an excellent summary of all the existing facts (or rather the want of them) on the subject of inter-oceanic communication, with very sensible remarks upon the many Utopian notions the public have been fed with by self-constituted engineers.

It is truly anomalous that scarcely a single fact relating to this Isthmus can be relied on; the writers seem to vie with each other in a series of contradictions, laying themselves open to the same charge of want of consistency, by their obstinate and one-sided view of the particular scheme they have made their hobby. One fault they all have, they deem it indispensable to have a river of some magnitude to commence their navigation on. The Atrato route, we are told, is undeniably the best, because once over the bar (like Mrs. Glass, 'first catch the hare'), for 200 miles, a natural water-course exists for vessels 30 tons burthen, and then a country 20 miles in breadth, and not much elevated over the sea (a guess made in traversing a jungle), offers peculiar advantages for a ship canal. That is, after converting a river of 200 miles in length from a scale fit for 30 tons to one fit for 2000 or 3000 tons, a new canal 20 miles long must be made. There is no

reason to suppose the summit level of the Andes is here less than the lowest point known from observation, viz. 430 feet as between Chagres and Panama.* Allowing a fall of six inches per mile in the water surface of the first 200 miles of the Atrato, there remains 330 feet to be surmounted by locks up to the summit, and 430 feet down to the Atlantic, or at 15 feet per lock (a very large fall) about 50 locks will be required to be supplied at a summit level, and from an imaginary supply.

If, "*ceteris paribus*," the cost of a canal per mile is the same at more than one point between St. Juan and the Atrato, this 20 miles of canal would go two-thirds across the Isthmus, which in many places is only from 27 to 35 miles broad; many rivers exist navigable for 10 or 15 miles for vessels of 30 tons burthen, without a "bar" at the outset, with only five feet of water on it; but throwing aside this advantage (which I think, would probably be a negative quantity in the estimate), is it not absurd to suppose that 200 miles of river course can be deepened from 12 to 18 feet at the same cost ten miles of canal can be made with a cutting varying from 30 to 40 feet at the outside. The item of

* This has been reduced to 290 feet by careful levellings taken for the Panama Railway.

“unwatering”* alone would in one case exceed the whole cost of the other. Again, in one case a navigation of 220 miles has to be maintained, in the other, one of 30 or 35 miles; both are subject to casualties in proportion to their length and the nature of the works, so that it is not unreasonable to suppose the longer route would cost in maintenance nearly four times as much as the shorter one, and be subject to four times the number of interruptions to trade. This comparison is even understated, as a large body of water like the Atrato, subject to great fluctuations in the wet and dry seasons, must cause more injury, and be more difficult to control, than a canal where the supply is limited to its requirements. The comparative engineering difficulties of execution cannot be correctly estimated, except by professional persons who have had experience in similar undertakings. In one case with which I was connected, a shoal in the centre of a broad river was ascertained by boring to be composed of clay, gravel and boulders, and so specified to the contractor, who tendered for it accordingly at one shilling a cubic yard. When the shoal was enclosed by earthen dams a steam engine was erected to unwater it; after several days pumping the level

* “Unwatering” is a technical term which implies the removal of water by pumping or other means.

in the enclosure was not sensibly diminished; a second, third, and at last seven steam engines of the aggregate power of over 100 horses, succeeded in laying the bottom dry. The excavation was then found to consist of enormous limestone boulders, some of them a hundred tons in weight, embedded in conglomerate clay and gravel. In consequence of the imperfection of the description of the material in the specification, and the difficulties to be contended with, the price had to be raised from one shilling to three shillings, of which the expense of unwatering was fully one half, although the excavation proceeded night and day to expedite the completion. In such a narrow continent as that joining the two Americas, it is almost hopeless to expect to find a river which is for some miles navigable for ships of large burden; if it requires deepening, the probability is that the material in the bottom is hard, the scour during floods being generally sufficient to remove all the alluvial deposit, as is proved by the formation of a bar at the mouth, and the deeper water above it. Should, however, dredging be available, a natural watercourse may with advantage be followed, as far as the class of material renders unwatering unnecessary, or the comparative cost of dry cutting and deepening the bed makes the latter preferable. Such cases, on the

scale under consideration, can, however, be scarcely expected to exist to any extent, so that a large river should rather be avoided for a ship navigation, its advantageous adoption being quite an exception under the circumstances of this western continent. The inquiry should be limited "to find the shortest line with the least summit;" if locks are indispensable from the nature of the section, a sufficient supply of water at the summit is a necessary element in the design, and other facilities must be abandoned to secure it. A good harbour at each end, or the means of making one, should be ranked as the first requisite to the success of the project, and all other considerations must be waived in its favour, as a perfect inland navigation, without safe means of reaching it or leaving it, would be the greatest engineering mistake that could possibly be committed. It will be useful to discuss the design of a supposition case which, however, must have in it the elements of what we know will probably exist in some part of the Isthmus.

Suppose a tract of country having at each end a natural harbour, or the capabilities for securing safe anchorage for the largest class of vessels, the distance across to be 30 miles with the summit level nearest to the Atlantic. See Plan No 1.

In the first instance let us suppose the summit

level be only 100 or 150 feet above the mean level of the seas, such mean level being presumed to be the same at both sides.* The Atlantic rise of tide is only 3 feet, that of the Pacific 25 feet, therefore the difference in their levels at high and low tide is 11 feet (this although partly suppositious, will, I anticipate, not be far from the truth). In such a case I would propose to cut a canal straight through, from ocean to ocean, without any locks, and having at low tide 30 feet depth of water,† the only limit to this design being the height of the summit, and the possibility and cost of cutting through it to a sufficient depth; if this is surmounted, the next important consideration is, what will be the effect in this canal of the difference in the tides without any lock to regulate their respective levels.

There is no doubt that at high water there will be a current from the Pacific into the Atlantic, and that during ebb tide there will be a current in the contrary direction. The extent of these currents and the place of their greatest effect depends upon the comparative sectional area of different portions, and if the cross section is uniform throughout, the

* Col. Lloyd states that the mean level of the Pacific is $3\frac{1}{2}$ feet above the Atlantic; in this general case this is immaterial; besides, the correctness of this has been questioned, and, I think, with reason.

† See Plan No 2, Design No 1, where the depth has been increased to 30 feet.

greatest current will be some time after high tide in the Pacific,* and at the Atlantic end of the canal.† A more perfect uniformity of current can be obtained by increasing the sectional area near this end.

Thus far theory and practice can conjointly predict the effect of the tides, but the measure of that effect is a question of extreme extricacy, and can probably be only solved by actual experiment. By induction an approximate estimate may be formed of the strength of the current, near enough to judge whether it will practically affect the navigation of large vessels. The *phase* of the tidal wave (or the appreciable effect of the tide) will take one hour and a half to reach from one end to the other, and presuming that the current is uniform in the whole length (either by proportioning the sectional area or approximating to it so as to render the difference of velocity unimportant), the question may be examined as a maximum : *i.e.* what will be the surface velocity of a canal 30 miles long, having a fall of 11 feet, or with a horizontal bottom having at one end 28 feet

* Dependent on the time the phase of the tidal wave takes to traverse the whole length of canal.

† Airey's Tides and Waves, § 312, p. 329. This conclusion is come to on the supposition one sea has no tide, and it is not strictly correct in this case; the Atlantic rising 1 foot, and 3 feet in springs and neaps, and the Pacific 23 feet and 27 feet; practically, however, this fact may be adopted.

of water, at the other 39 feet? Well known equations give the result at about 3 miles an hour,* and the duration of this maximum current cannot exceed two hours, viz. one hour each way, the velocity diminishing rapidly with the decrease of fall.

The hypothesis of treating tidal action, which varies in every instant, by the same method the velocity of running water is obtained, is no doubt incorrect, and can never give results strictly true; it is, however, an approximation quite near enough for practice, and probably exceeds the truth. Mr. Stokes, of Pembroke College, Cambridge, has been kind enough to apply pure mathematics to this suppositious case, and although when I left England he had not come to a result which embraced all the circumstances of the motion, he anticipated my own conclusions would not be far from the truth.

If I can find a section across the Isthmus of Darien which satisfies the conditions laid down, this design would be the most perfect that circumstances can admit of; the most simple, the easiest executed, and

* By De Buat's formula:—

Mean depth	=	33.50 feet.	$55\sqrt{25.11 \times 2 \times 0.36} = 237.15$ ft.
Mean width	=	183.50 "	equal mean velocity per minute.
Border	=	244.80 "	237.15×60
Area of water section	}	= 6,147.25 s. ft.	$\frac{5,280}{2.69} = 2.69$ miles, equal
			mean velocity per hour.
Hyd. mean depth	=	25.11 feet.	$\frac{2.69}{0.837} = 3.21$ miles, equal maxi-
Fall per mile	=	0.36 "	mum surface velocity, say
			3 miles per hour.

the best for the shareholders, as nearly all tolls would be clear profit, the cost of maintenance being very small.

In the next case suppose the summit to be such as to prevent an uninterrupted cut from sea to sea, (see Plan No. 3, Design No. 3). The use of locks must here necessarily be introduced, with weirs and other works for regulating flood waters, and reservoirs with sluicing apparatus for supplying the deficiencies during the dry season. Here then engineering skill must deal with difficulties of no ordinary kind, the dimensions of the necessary works, the nature of the climate, and the difficulty of employing *skilled labour*, all combining to render the task most peculiar and unlike anything that has been accomplished. Let us take a short review of the obligations and requirements which such circumstances enforce upon the design.

The first is a certain and sufficient supply at the summit level.

The next, such arrangements as will prevent an interruption by floods, either from injury to the works or the creation of so strong a current as to prevent navigation.

In the third instance to reduce *skilled labour* in the country to a minimum, or, in other words, prepare as much of the work as possible elsewhere.

Lastly, to secure the passage of all vessels with security and the least loss of time.

The two first conditions can be satisfied by a capacious reservoir, so constructed as to afford a supply during the dry season, and act as a regulator of flood waters during the rainy months; such a reservoir must, therefore, necessarily form the catch-water basin of as much of the water-shed of the district as possible, and have its extent fixed by the determination of the maximum and minimum supply of such water-shed, with an allowance for evaporation under a tropical sun.

To transport artisans from England or the United States, who have been accustomed to railway or canal works, would not only be very expensive, but would also, I fear, be attended with injury to their health, and probably considerable mortality, from the want of their being acclimatised; it is, therefore, important that all material requiring skilled labour should be brought to the spot in as forward a state of preparation as possible. This can best be done by substituting ironwork for stone wherever practicable. I cannot follow out this argument without dipping into engineering details, which would not interest an unprofessional reader; besides the adoption of any particular design in this respect depends so much upon the facilities of procuring good stone, lime,

sand, &c., in the country, and the exigencies of the locale of the works, that no suppositious case would probably satisfy the reality, when such is ascertained.

A canal of sufficient depth and width, without any strong current can be easily navigated by large ships towed by steamers. The difficulty commences at the first lock, and the chief delay is caused by casting off, entering it, and retackling. It is, therefore, very advantageous to have all the locks together, so that the two vessels could be warped out of one lock into the next, and only be one lock in arrear of each other. Such an arrangement would also economise waste water, should the summit supply be a limited one.

The best design to satisfy these conditions is the following.

* If a river is in existence in the most favourable site of the harbour, the first operation is to enlarge and deepen it, by dredging as far as practicable ; then either to follow the river, or diverge from it at the same level, until the land on each side becomes high and the material to be removed rock or some firm substratum ; these circumstances are likely to coexist in a country whose chief geological formation is igneous. At this point an embankment should be made from hill to hill, strong enough to resist the

* It must be remembered that this was written before I had visited the Isthmus, and was, therefore, wholly hypothetical, although it does now agree with existing facts.

pressure of the water, and high enough to form behind it an artificial lake, so that a cutting through the summit of from 50 to 100 feet deep, as short as possible, should connect it with a similar lake on the other side, formed also by an embankment placed in the most advantageous position; the navigation from the opposite sea to be formed in a similar manner to that out of the Pacific. The design comprises three levels. Two tidal navigations and a freshwater lake; all the locks being concentrated at the two points where the embankments bound this lake. The extent of this lake depends of course upon the peculiar formation of the country, but it cannot probably be less than ten miles in length and from one to three miles broad, nor is it likely that any other than two embankments will be necessary to retain its waters, because the summit to be crossed is chosen as the lowest available ground in the water-shed, and it is to be cut from 50 or 100 feet. By proper arrangements this lake can be made to have a range of several feet in its surface water without interruption to the navigation, and will therefore act both as a reservoir of supply and a regulator of flood waters. The only objection is the loss of land inundated, but supposing even the land to have any value (which it has not) I think the advantage offered by the length

of shore formed, to which navigation is accessible, will enhance the value of the surrounding country far more than the loss of a few square miles of land ; in addition to this a great saving will be effected by forming with two embankments, a few thousand yards long at the outside, several miles of navigation in which the slopes require no protection from the wash of steamers. All detritus brought down by the mountain torrents, including uprooted trees, so well known and feared as "snags" in the rivers of the United States, will be deposited upon the shores of this lake, and the formation of shoals thus prevented : the surplus waters will also, by being let down with the ebb, give a great scouring power to the tidal portions of the navigation.

I hope a tract of country will be found where the general principles of one or other of these cases is applicable. My anxiety to secure success makes me speculate on probabilities and possibilities, founded on the scanty information obtained by reading about the country. Scarcely, however, do I picture to myself a supposed reality, than a direct contradiction in the next book I take up dispels the illusion, and leaves me where I commenced, in perfect ignorance of what to expect.

On the 24th April we sighted the Virgin Islands, at about 3 in the afternoon, and at 2 P.M. lay off St.

Thomas' Harbour until next morning. We anchored at day-break, and the Thames and Derwent steamers came alongside to tranship goods and passengers for Jamaica and Barbadoes. We proceed to Cartagena as soon as 500 tons of coal are taken on board.

The Island of St. Thomas belongs to the Danes, and is a free port. Its extent is small, about twelve miles by two, and the character of the ground high with steep sides, consisting, as far as I can judge, of igneous rock, with no soil except in a few spots, on one of which only is sugar-cane grown. The town is most picturesquely situated on one side of the harbour, which is one of the most perfect little inlets I ever saw. It is formed by an island and St. Thomas *propríá*, and had at one time two deep entrances; now the western one is closed by an accumulation, caused by the wash of the sea against an artificial barrier, placed to prevent the escape of pirates when this place was one of their strongholds. The ruins of three towers of observation erected by these adventurers for their own protection are still to be seen; they are placed on high ground with almost inaccessible approaches, and command a view to the Virgin Islands, Santa Cruz, and in clear weather Porto Rico. Thus, any vessels trading to the West Indies or the Spanish Main, could scarcely pass without their knowledge. Since the Danes first colonised the island, the trade

has been steadily on the increase ; it produces nothing itself, but being a free port, is the emporium of European goods for all the West Indies, and is, without doubt, the most thriving place in these seas. At present there are over 100 vessels at anchor, and one Danish man-of-war.

St. Thomas was the last island in which slavery was abolished. In 1847 a negro insurrection broke out in Santa Cruz, and the Governor proclaimed emancipation, but not until considerable excesses had been committed ; when the news reached St. Thomas, the white population were panic-stricken, and the slaves took advantage of their position to secure to themselves their freedom. In an account of this social change published by a clergyman here, it appears that in this island private property was generally respected, and not a single life was lost. The authorities refused to protect the town or allow the militia to do so, it being very evident that the Home Government were only too glad to get an opportunity to proclaim emancipation, although they have not yet followed the example of England and France by paying compensation for the loss to the slave-owners. A "Labour Act" was drawn out and proclaimed by law ; but freedom was too great a boon to be chained down again by any restrictions, and although this code seems to be of a very plausible

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character, having a parental care of all classes, its provisions are inefficient, because the whip, the only power to enforce obedience, was taken out of the employers' hands. St. Thomas, being strictly a trading post, suffered less from the consequences of emancipation than where native produce formed the staple trade; but to this day, country labour, or such as is necessary for sugar plantations, is considered a degradation by the negro, the thralldom of slavery being too fresh on his mind not to associate the sugar-hoe with the whipping-post. I have not seen slavery, and therefore cannot judge whether emancipation has bettered the condition of the negroes or not. I must however own, I am much inclined to believe, that as yet it has not done so; although the evil was great, the remedial change has been too rapid. During the hey-day of slavery, every refined feeling, every precept of morality, every sense of right and wrong was wantonly abused, cruelty was measured by the value of bone and sinew, and the lasting powers of the object. The ties of parentage and matrimony were disregarded, and Smithfield itself with its too well-known tissue of horrors, was a paradise to the slave-market; in one, the miseries of the creature were shortlived, in the other, they only commenced. This state of things was suddenly changed, the slave educated under the lash with only

a sensual appetite to gratify, all at once found himself his own master. He grasped at liberty, and sought it in the enjoyment of passion, the only inward feeling that was left him—a whole life's thirst for what he unexpectedly obtained, could not be satisfied by a few weeks or even years of revelry—work was slavery, only to be endured when dire necessity was at his door; his wants were few, and his natural indolence great; he became his own master, without being able to master himself. What else could be expected? as a question of secular education, politicians should reap a lesson from this state of things. Is the *mind alone* sufficient to guide the evil passions we are heirs to? There are gradations in intellect as well as in bodily power, and although education may improve, I do not think it can equalise; I have sufficient belief in phrenology to doubt if any negro could be a Newton or a Humboldt — and history would not lead one to believe in the hereditary transmissions of mental cultivation, although instinct is evidently improved by careful breeding. There can be no doubt that the very small amount of cruelty (comparatively) shewn by the negro population towards their late oppressors was due to the influence of the missionaries, and it is remarkable how this power works. Over their passions, little or no controul exists, nor can their aversion to improve them-

selves be overcome by precept and example.* The outward form of worship and the appreciation of preaching, is evident by their regular attendance in church, and their attentive and respectful behaviour. It is not, however, Christianity, it is only aping their betters and trying to impose on themselves. The solemnity of the service, the vying with each other to look like Christians, and the pleasure of seeing one of themselves (as is generally the case) in so dignified a position as the pulpit, stamps with a certain degree of gentility, the bugbear that half the world is aiming at. In fact, it is the *fashion* to be Christians, and so they are Christians. They acknowledge a certain power in their pastors, because it has as yet not interfered with their darling *liberty*, in the most extended sense of the word; I hope this power may eventually lead them to a higher social state. Things naturally run to extremes; during slavery a negro was treated like a dog; now that he is free, the white man addresses him with the greatest courtesy, leaving the impression that the master is always under an obligation to the man.

April 26.—This morning, shortly after five, Forde and I got two ponies, and proceeded to ascend the Solberg, the highest hill in the island. A good horse-

* I allude to the past not what may be done by other means.

road, though very steep, led us in an hour to Mr. —'s, an Irishman, who settled here about thirty years ago, and has secured to himself a competence, I presume, during slave times, as no sugar plantations are now cultivated on his property. We were hospitably received by him, and talked over Irish affairs, which seemed to interest him much. From this point we had to climb the hill on foot for nearly a mile; each carried a mountain barometer, having taken observations before starting. The igneous character of the rock was apparent at every step; once or twice I thought I had found traces of newer formations, but was only deceived by the form and colour of the decomposed rock through atmospheric agency. In some places this disintegration has formed an earth of two and three feet deep, of a brownish red colour, with nodules of igneous rock interspersed through it; other portions are nearly white, resembling chalk; but this latter class was only found in cavities formed through the agency of water, the beds of several torrents (now dry) having to be crossed by small gulleets. It is also believed that underground passages exist, into which, in the rainy season, some of these torrents disappear: this is not improbable, from the irregular disturbance of the whole mass, and the remarkably arid appearance of the surface.

On the top of Solberg grew a few cocoa-nut trees, a small underwood of guava trees, and a sort of stunted willow, bearing a yellow flower and a fruit like a small tomatoe, but green. We took advantage of the shelter afforded from the morning sun, and commenced barometric observations. The mercury had fallen nearly an inch and a half, and after checking the result on our descent, we determined the height of the hill to be 1388 feet. Dr. Hornbeck fixes the height at 1515 feet. He does not state how he made his measurements. We returned about 9 A.M., and after a most refreshing sea bath, did justice to a *dejeuner à la fourchette*, where claret and iced water was an excellent substitute for tea. The afternoon was occupied by a boating excursion towards the entrance of the harbour, and an examination of the rapid decay of the timber piles in the old coaling wharf (only erected eight years), and the geological formation of the south point of Coaling Island, where evidently the rocks are not all Plutonic. This island runs nearly perpendicular to the general direction of disturbance, and may be considered as a spur from it. It has two summits, the one nearest to the main line of disturbance being igneous; the other, not so elevated, and having much less abrupt sides, is stratified, and appears to be a new sandstone, perhaps of the tertiary series.

From the seaward of this hill runs out a coral reef, and it is said nodules of limestone are found on the shore. I regret I had not time to search for them, as it is important this should be determined. Dr. Hornbuck found similar nodules* on the north-east side of the island, on a projecting point of land running nearly parallel to Coaling Island which is also a spur from the main line of disturbance. A specimen examined by the Geological Society in London, was supposed to fix it as an oolite. On my return to St. Thomas, if I have time, I shall examine further into this subject, and add to the specimens I have already collected, so as to place the Geological Society in a position to determine the age of these rocks.

The old coaling wharf was built about eight years ago. The piles consist both of resinous and hard wood. They were charred for a few feet between wind and water. In two years it was evident that the worms had attacked them, and now there is scarcely one of them that is not eaten through. I got one broken off at water surface, and having sawn off the sound top, took the affected portion with me. The worm is evidently that so well known on the east coast of England.† It is of a red colour,

* Historical Account of St. Thomas, by J. P. Knox, page 211.

† Teredo Navalis. See Vol. 2 of Proceedings of C. E. Institute of

and nearly transparent, thin, an inch and a half long, and with a large head protected by a helmet of shell.* As it works into the wood, it follows the fibre, leaving in the place of what it has devoured a trail of calcareous matter, hollow, and of the bore of its head. It works only a short distance above and below water, being evidently amphibious. Various modes of prevention have been adopted, but without success. Charring the portion of it which is subject to wind and water will extend its duration a few years. Sheet copper, a studding of iron nails, and other external protections, make the decay a question of time, but no plan has acted as a preservative for more than a few years; one sort of timber, however, is said to be entirely free from the attacks of this wood worm. It is called here "Green heart," and is chiefly brought from Demerara.† It squares from 13 to 16 inches, the

Ireland, where Mr. M. B. Mullins, in a paper read before the Institute, classifies the various sorts of sea worms known in the British Isles.

* See Lyell's *Elements of Geology* (1852), page 24, giving a woodcut.

† Sir Chas. Lyell, in his *Second Visit to the United States* (vol. i. page 236, New York edition), writes: "The Cabbage Palm, which grows in Skidaway Island, Georgia, is a noble tree, and is said by Elliot to be invaluable for submarine construction, as it is never attacked by the ship worm." He adds, "I saw sections of the wood, and the structure of it resembles that of true palms."

This "Green heart" has not at all the appearance of the palm tribe, being very hard, heavy, and close grained.

logs varying from 25 to 50 feet in length. It is very hard and heavy, will not float, and has a bitter taste : it is to this last quality that is attributed its freedom from the worm.

The new coaling wharf, in progress of building, is made of this timber. The piles are both charred and coppered for a few feet above and below water's surface, and driven by a small ringing engine. I can form no opinion as to the success of this experiment, none of the timber having been more than a few months in use. I was told the cost exceeded 2s a cubic foot when delivered, and that a cargo of it had lately been consigned to some house in London.

April 31st.—Early this morning we anchored opposite Santa Martha, a small town situated on the coast of South America, in the province of New Grenada. Behind it the Andes rise to beyond the limits of perpetual snow, breaking off into innumerable spurs forming deep valleys, down one of which the small river of Santha Martha winds, having the town close to its mouth at the return of the bay of the same name. The scenery is most imposing, and as wild as any one could wish ; but the apology for a town looks the picture of desolation. The British consul and his wife came to breakfast and dine on board—their bi-monthly entry into society. I am quite sure the most sanguine financial reformer could not say that £400 a year was sufficient compensation to

a man of education with the requirements of civilization, when expatriated to such a hole, with an ecliptic sun for eight months in the year, and incessant rains during the other four. I cannot understand how the trade of the place can possibly require a consul, or why the mail steamers should call there, as the communication to the interior, particularly to Bogota (the capital of New Grenada), is from Cartagena. Few places have suffered from earthquakes more than Santa Martha. In the cathedral (for like most Spanish settlements, it is prolific in churches) the walls and pictures are cracked in several places, although an earring of the Virgin Mary is shewn as the emblem of its sanctity. Emeralds are found in the neighbourhood, and some I saw were very large, but imperfect. We weighed anchor at 5 P.M., and after a stormy night arrived at Cartagena about 9 next morning, nearly six days after our time. From the seaward Cartagena looks dignified; long lines of fortifications, bristly with cannon, a number of churches with arabesque towers, lofty ranges of buildings impress one with the idea of a solid sort of civilization, and the remains, if not the existence of wealth. Its motto might well be "Fuimus," for a more woe-begotten place is seldom met with. First we went through the mock ordeal of a clean bill of health on board, like coals going to

Newcastle, having come from a healthy clime to one noted as quite the contrary; then we had sixteen shillings extorted for landing ourselves and baggage at the Custom House, where, I must say, we were shewn every possible civility, and put to no trouble. The Hotel of California being recommended as what is called in Ireland the "head inn," (two or three being generally so distinguished in every town) we proceeded to it. Our landlord and his wife are both Germans, but quite naturalized to Spanish habits, as far as dirt and want of comfort are concerned. A dilapidated and almost interminable staircase led to an attic, where a red brick floor, surrounded by dunderbuckety mud-coloured walls, and roofed principally with cobwebs, contained three bedsteads, one wash-handstand, a tooth brush, and one chair. This is the "state room," which, we were informed, had been most fortunately vacated that morning. In despair we went to the British Consul's, but found no better accommodation was to be got; and to comfort us in our misfortune, we found Dr. Cullen had not returned from Bogota to accompany us to the Isthmus, according to arrangements made in London, and that we must wait ten days *at least* before he could return.

May 9th.—We have just returned from a very pleasant trip into the country. In the course of

conversation, the Consul (Mr. Kortright) mentioned that a few years ago the Government had made a canal connecting two inland navigations, the Dique and the river Magdalena, but that the works had failed, and the trade of the town had been seriously affected. As I had a few days before me, without any fixed occupation, I volunteered to visit the place, and give any assistance I could professionally in remedying the evil. The Governor of the province of New Grenada jumped at the offer, and expressed a wish to have an interview. On the 4th May, at noon, Mr. Kortright and I were ushered into a large and lofty room, down the middle of which two rows of rocking chairs faced each other. In a few minutes the Governor appeared with his Secretary and several other leading men. The rocking chairs became animated as well as the conversation, and after examining a few plans, in which colour and flourished headings took the place of more useful information, it was decided that Forde and I were to start that afternoon at 4, for Turbaco, a village fifteen miles from here, and where Mr. Kortright has a small Indian villa. Both he and his brother accompanied us. This village is perhaps the most civilised Indian settlement in the province, and General Santa Anna, (who resides here since his banishment from Mexico,) has added not a little to its natural picturesque appearance by new houses, and a large and well-

arranged garden, irrigated by a neighbouring stream, and yielding European vegetables, besides the delicious fruits of the Tropics. By barometric observations we determined the height of Turbaco to be 550* feet above the sea; it is the highest summit between Cartagena and the valley of the Magdalena River. The rock is coralline limestone, the same as at Cartagena, and forms an important link in the geology of the country. The roads are only bridle paths, almost impassable in the wet season; a single track through rank vegetation, hiding innumerable lizards and snakes, and overgrown overhead, winds and twists among stumps of trees and sloughs of water; but the country horses amble away at six or seven miles an hour, with as sure a footing and as easy a gait as if M'Adam had been specially retained. I was quite surprised how a small pony under 14 hands carried me during the whole week from 30 to 50 miles a day without shewing the least sign of distress; with my saddle and holsters I must have been sixteen stone on his back. In the afternoon of the 5th we started† for Mahates, a village situated on the Dique river, of which more anon. The country is

* Humboldt makes this point 1151 feet above the sea; but as no data is given how this measurement was made, I must set it down as erroneous. I made two separate sets of barometric observations, varying only 20 feet between them, and 550 is the highest of the two.

† Forde, Kortright, jun., and myself.

undulating, with steep sides, but nowhere does it exceed the height of Turbaco. A continuous thick wood prevents any distant view, but the beauty and variety of the tropical vegetation compensate for the want of distant scenery. In England a wooded landscape pleases from the contrast between a green sward and wide-spreading foliage, extent and variety of undulation being necessary elements in the picture. Here the view is bounded by a wall of vegetation, rearing itself within a few feet of the observer; and as the eye scans it from the ground to the top of the lofty palms, graceful forms and dazzling colours continually gratify the sense and lead the imagination towards those Elysian bowers where mythology placed the abode of their Deities. Clusters of bamboos are overtopped by guava and acacia trees, aloes and lofty cactuses intermingle with guinea grass, and innumerable creeping vines hang in festoons from every branch, presenting even after the extinction of their few months' vitality, graceful forms and fine-spun fibres; again, as if Nature was not content to shew her procreative power from the matrix of all growth, parasites fasten on to the highest boughs, and grow upon second-hand nourishment, as if scorning an earthly bed. I remarked one tree in particular in this afternoon's ride, where beside a number of aloe-like parasites, there hung from every branch pen-

dulous nests like those which it is said the Chinese make soup of; the architects of these wondrous aërial houses are small black birds, with a yellow tail, and a very harsh shrill call. It is not improbable they feed upon the seed of the aloe, and thus transport it to the branches, where it naturalises itself.

In the evening a shower would have wetted us through, had it not been for the excellent oil silk capes we were provided with. No one should travel in the tropics without them; and they ought to have an attached hood, or what is, I believe, technically known in ladies' millinery as a "capote," so as to protect the head and neck; mine rolled up so as to fit into one of the holsters.

About sunset we arrived at the Dique, where I examined the ruins of a new bridge, whilst our horses were being swam over the river; our traps and ourselves eventually crossing in a canoe. The bridge had been intended to act as a swivel, or bascule, leaving a clear opening of 40 feet, but imperfection in design and construction soon made it take a downward course into the river, obstructing the water instead of leaving a passage. To build such a bridge for the transit of mules and horses traversing a road almost impassable during four months of the year, and at best a bad bridle path, is one of those contradictions in human nature which this country

seems to delight in. A black woman, whose face and figure might serve as a model for the mother of the "gentleman in black," if he ever had one, adorns her person with glittering trinkets and gaudy coloured garments, wearing in her woolly head some choice specimens of nature's flower garden; she struts and gives herself the airs of the most ultramontane stage queen, and is most sensitive about her charms being called in question. All around is activity and life, except the miscalled lord of the creation, whose indolence and arrogance rise with his poverty and degradation. Life has but two phases; a bare existence, or a sinful misuse of superabundance. Wages are good, from 1s. 3d. to 1s. 6d. a day, and paid in advance; of that a few pence go for food and raiment, the rest for spirituous liquors, tobacco, and finery. Thriftiness is unknown, as it was in Ireland a few years ago; the ease of existing being the stop-gap to progress. The village of Mahates was our head-quarters for the night; the rain of the afternoon had flooded the whole place, the water being within a few feet of the floors of the houses. Poached eggs, an omelette, and some shreds of jerked meat, satisfied our hunger, and after swinging six hours in our hammocks, we rose at four in the morning to ride before breakfast to Calamar, on the Magdalena river, a distance of 33 miles. A glass of water, of a very

“loud mud colour,” and anything but as cold as ice, with innumerable cigars en route, kept hunger on the threshold of our appetite. The first five miles the path was flooded, and the moon was just sufficient to guide us among stumps of trees and deep sloughs. A few bats and owls flickered across our path, but until daylight no sound was to be heard. Gradually, however, the noisy grasshopper (whose imitation of a railway whistle is perfect) woke up both the reptile and feathered tribes, and the vitality of day resumed its functions. I was disappointed in not being struck with the sunrise. I had pictured to myself an imposing sight when the first rays should glitter upon the dew-clad leaves; no such thing, however, and the transit from night to day was as humdrum an affair as ever was seen in England on a cloudy morning. Here I first observed the cuipa tree, a noble, straight-growing tree, branching out into three gigantic arms, like an open umbrella. The stem is thickest from 15 to 20 feet above the root, and then gradually tapers towards the top; no branch or knob breaks its outline until it soars high over the surrounding forests. One which I measured was 20 feet in circumference 5 feet from the ground, and could not have been less than 8 feet in diameter in the thickest part. These trees grow generally two or three within view, and form a most imposing

sight; their massive stems are proof of their age, which must be counted by centuries, yet could I find no trace of decay.

At Santa Cruz, about 12 miles from Mahates, the character of the rock is igneous, and I picked up several specimens of porphyry. The village itself is situated on the summit separating the valley of the Magdalena from the Dique. It is evidently a spur of the Cordilleras, having a sandstone upon the north-eastern slope, as far down as the alluvial lands of the Magdalena and Dique rivers. The air here was deliciously cool, the thermometer being 74° in the shade, and partial clouds saved us from the rays of the sun. The houses are all made of bamboos set close together and roofed over with palm leaves; the tying together and framing of the roof is ingenious and very strong; I at first wondered how the light bamboo walls supported such a heavy looking top. In some houses the outside of the bamboos are plastered with mud up to within a couple of feet of the top, and there every second or third bamboo is cut away, leaving an air passage to cool the house; but this is only among the better class, such as the persons in charge of cattle stations or maize farms. The kitchen is usually in a separate house, the cooking being done with wood charcoal. The Indians do not use hammocks at night, but sleep in

a sort of family bed made up of bamboo canes and covered with a mat ; the ingress of mosquitoes is prevented by closing all doors and shutters (if there are windows) at sunset, and allowing no light in the room ; a smothered rest is thus obtained in preference to an active state of wakefulness. The children all go about naked until they are seven or eight years old, and exhibit a corporation of which an alderman might be proud ; both sexes, at all ages, shew a great propensity to a proud stomach, the females priding themselves particularly in imitating ladies in an interesting situation.

I think that this deformity, for in many cases it amounts to that, is caused by the way children are carried and put to sleep when young. The child sits straddle legs on his mother's hip, with one of her arms round its waist, its little legs grasping fast hold of her thigh. At night the urchin is laid on the ground on a mat, flat on its stomach, with its face buried into a sort of a cushion. This position bends the small of the back into a concave shape forcing the stomach into what the French call the *bas-ventre*—added to this, bulky food with but little nourishment (such as the fruits of the country, a sort of maize bread which is half water, and a quantity of water thickly impregnated with mud,) and the want of support in early youth, usually

derived from clothing, tend to corporation development, and fashion assists nature in making this apparent.

To digress a little from the road, I was greatly surprised yesterday by seeing a little urchin under three years old smoking a cigar, sitting on the floor with a pair of red boots as his only clothing. He puffed away in most finished style, and had half finished his baccy, when his stepfather (our landlord) came in and took it away from him. At this a most awful screaming fit possessed the juvenile, and kicks and tears shewed how much he felt the deprivation. His stepfather told me that nothing could cure him of this habit, and that he often smoked three and four cigars in a day when he could get hold of them on the sly, no detrimental effects ensuing to his health. The common cigars of the country are by no means mild, and are full sized, not the cigarettoes which Spanish ladies indulge in.

At Calamar, where we arrived about 11 p.m., Mr. Ritchie, a Scotchman, who manages a tobacco estate, received us most hospitably, and prepared such a good repast, that my appetite overcame my discretion, and long fasting, bad water, and a hearty meal, made me pass a most uncomfortable night. The Magdalena is a magnificent river; at Calamar it is at least 600 yards wide, rolling its muddy waters at

between three and four miles an hour; its surface is chequered with floating weeds, logs of timber, and alligators' heads. During the rainy season it rises thirty feet, flooding the low lands on each side, and forming innumerable lagoons and marshes, the germ of fevers and agues, and the habitation of tormenting reptiles and insects. It is navigable for 450 miles above Calamar, and 150 miles down to its mouth, where a bad and very shallow bar crosses an open roadstead. I am told some steps are being taken to avoid this bar by a side canal,* but as there is no secure anchorage anywhere near, it is not probable that it will be carried out. The Magdalena river is the back-bone of New Grenada, and its chief internal means of communication. The capital Bogota, lies about 65 miles west of the river, and on the Cordilleras; Humboldt makes it 8700 feet above the sea. It contains 40,000 inhabitants, and its whole commerce is carried along the Magdalena; some goes to Santa Martha, some to the mouth of the river, but the principal part to Calamar, and from thence on mules to Cartagena. It is to secure a monopoly for Cartagena that this Dique navigation was commenced.

* A report has been published by an American engineer recommending an expenditure of about £13,000; he states that the canal when finished will be liable to fill up, and will require constant dredging to keep it open.

There is no doubt that nature intended Cartagena to be the first port in New Grenada, as its position, safe anchorage and extent invite any amount of shipping. There used to be two entrances, Bocca-Grande and Bocca-Chica, but the Buccaneers made such good use of them to surprise and pillage the town, that the Spaniards filled up the Bocca-Grande and built the massive fortifications which to this day surround the place. The Dique river debouches just outside this harbour, and following a north-easterly direction for upwards of 80 miles, reaches to within 12 miles of the valley of the Magdalena. It is very evident, however, that the Dique was at one time an outlet for this river, and perhaps the only one when the coralline limestone about Cartagena was still the bed of the ocean, for the intervening country consists entirely of alluvial soil. The Spaniards at an early date connected the Dique and Magdalena by a canal, the remains of which can still be traced winding through almost impassable woods. It appears, however, from a published history, that it was only navigable during the rainy season when the Magdalena was swollen, and the tariff on goods was so high that but little use was made of it. Since New Grenada declared itself an independent Republic the Dique navigation has been one of the most often mooted

questions. About seven years ago £60,000 was raised by forced loan, and a contract made to form a junction canal of 12 miles, with two locks, and to remove some obstructions in the Dique itself. The money was paid in Government bills, which were at a depreciation of 25 or 30 per cent; the contractor failed, and the works were left incomplete. A steamer did twice ascend from Bocca-Chica to Calamar, but the first rainy month caused such dilapidation to the canal banks and the locks, in consequence of no back drains being made to take off surface water, that no further use could be made of the navigation, and three years of rainy season and tropical vegetation have aggravated the evil very seriously. The upper lock, or that leading to the Magdalena level, is at Calamar. Last autumn there were 30 feet of vertical pressure against the upper gates. I am surprised they did not give way, as the lining walls are of brick, and not sufficient in section for such a head. The gates are of "*lignum vitæ*," very cumbrous, but sound. The canal is brought into the Magdalena at right angles, so that a bar is formed from the deposition of mud in the eddy.*

* In my report on the Dique, I recommend that a permanent current of a mile or two an hour should be established along the whole length, by letting in water from the Magdalena through a system of sluicing.

As I was an invalid, Mr. Ritchie gave me his second bed which had mosquito curtains, but Forde and Kortright, jun., swung their hammocks, and were occupied all night warring with innumerable mosquitoes. We were all glad when the first ray of light appeared in the east, and immediately after breakfast, started on fresh horses (hired at Calamar) to ride along the canal banks to the lock at the Dique end. Our guide had but one arm, but he used the stump of the other very successfully to guide his horse, and we were at Santa Lucia (seven miles) in less than an hour. This Indian village is situated a little more than half way between the locks, and is a large cattle station for cheese-making. We got there just as the cows were being milked, and enjoyed some syllabub. None but Indian horses could have carried us more than seven miles in fifty-five minutes, along a path winding among trees and stumps, and full of holes, worn by rain water percolating into the canal through underground passages. The canal itself is grown up with aquatic grasses floating on the water, but so interlaced and tenacious, that in many places they form a bed over a foot in thickness, and strong enough to support me; what in Ireland is technically

This will stop the rapid filling up which is evidently going on, and prevent accumulations of mud and aquatic grasses. The latter grow so quickly that they form acres of floating islands, which shift their position with winds and currents, and can be walked on dry shod.

known as a "scraw." We reached the second lock before 9 A.M. and after examining it, returned to near Santa Lucia to strike off for Royondo, a village twelve miles distant, where we had sent our Cartagena horses to meet us. Our guide told us there once was a path through the woods, but he had never gone it, and we soon found out the truth of his statement.

After crossing the old Spanish Dique, up to which point the soil was alluvial, growing nothing but fan-leaved palms without any underwood, we followed a sort of track for a couple of miles, and then came to several paths; we chose the one whose direction seemed to correspond with our destination, but soon found ourselves in a wilderness of brushwood: after persevering for two hours, taking care to break a few branches, so that if necessary we might retrace our steps, we reached the road leading to Royondo, and found our guide and horses waiting for us. Part of a turkey given to us by Mr. Ritchie with poached eggs and milk, afforded a sumptuous repast; after which we swung our hammocks, and let the heat of the day pass before we pushed on to Mahates, where we had slept two nights before. We arrived there before dark, having ridden forty-eight miles, and we slept six hours in spite of mosquitoes and heat, and next morning were early on horseback, and returned to Mr. Kortright's villa in Turbaco in the forenoon

of the 9th, where a good wash was not the least enjoyable comfort we got.

Towards evening we each donned a full suit of white, and went in state to call on General Santa Anna; unfortunately he was not visible, and we had the mortification of resuming our flannel trousers and blouses without being repaid for the care we had bestowed on our persons. I busied myself during the evening in labelling and noting down the geological specimens collected; the guide evidently took me for a lunatic or a sorcerer, every time I consigned to his charge a stone with strict injunctions to keep it safe. I also took the temperature of boiling water to check the barometric observations of the height of Turbaco above the sea. The results agreed to within a few feet. I used Professor Forbes' rule, viz. a direct arithmetic proportion in which one degree of temperature is equal to $549\frac{1}{2}$ feet of elevation.

The arrival of the English mail on the 11th, and the departure of the outward steamer yesterday kept me so busy letter writing, that my journal had to be neglected; besides the Sappho ten-gun brig has anchored in the harbour, and exchange of civilities and dinners at the consul's occupied the few spare hours I might have devoted to scribbling. The Hon. Captain Cochrane has a scientific turn, and is surrounded with thermometers, hygrometers, baro-

meters and magnets, besides a regular chemical laboratory. I received a great deal of information from him, and was supplied with several small things which had been lost or forgotten, such as an extra compass, a magnifying glass, &c. &c. He has kindly offered to take with him a box of geological specimens I have collected for the museum in London.

To resume the narrative ; we left Turbaco at seven o'clock on the morning of the 9th, and rode to the volcancitoes, a curious collection of mud springs, accompanied by the bubbling of air. Each spring has by its action formed a small conical mound of deposited matter on the summit, from which the air exudes, and every now and then after a more than usually violent bubbling the water overtops the small natural mud wall formed at the apex, and clearing itself on its passage down the side of the cone, eventually reaches a small stream, which separates the two basins in which these volcancitoes are situated. As long as any deposition of mud takes place no vegetation is apparent. The contrast of these two barren basins, in the middle of an almost impenetrable wood, is very striking, and offers an instructive study of the regularity of nature's laws in principle, notwithstanding their apparent dissonance in practice, to those empirical forms which man has in his self-conceit laid down as

rules for the guidance of elements of whose very nature he is often ignorant. Humboldt visited these volcancitoes, but is silent as to their cause, except some general opinion of igneous action. He states the air which bubbles up is pure nitrogen and extinguishes flame, whereas a gentleman, long resident near Turbaco, told me that the natives collect this gas in bladders, and that it will burn freely. If such is the case it is probable it may be carburetted hydrogen, and that it originates from the decomposition of lignite or some other carboniferous stratum. I have got a bottle of the water and mud with me, and will have it analysed on my return.

Turbaco, as I before stated, is situated on coralline limestone; as you proceed towards the volcancitoes along the ridge of disturbance, a fault occurs in a shallow cross valley, and a sandstone,* apparently belonging to carboniferous series, forms the basis of the narrow backbone, with steep sides near the summit of which the volcancitoes rise. By barometric observations I determined this point to be 105 feet below Turbaco, and from the direction of disturbance, and the impermeable mud thrown up, I think that this phenomenon is caused by the chemical action of

* This sandstone is very heavy, probably from the presence of iron. It effervesces slightly with muriatic acid, denoting the presence of lime

water upon a carboniferous bed, which either a fault in the stratification or cropping out at this point gives vent to. The evolution of mud is probably caused by a bed of clay separating the layers of lignite, or those from the sandstone, which is disturbed by the running water and brought to the surface in a state of suspension by the action of the escaping gas; this clay is also the cause of intermittent instead of regular discharges, by stopping up in its deposition the air passages, and being again displaced when the force of the collected gas is sufficient to overcome its inertia. The dense forest and thick coating of vegetable earth makes it difficult to explore this country, and want of sufficient time to do so prevents me from affording all the information which this interesting neighbourhood requires to be collected to account for the geological phenomena everywhere apparent.

In trying to obtain the temperature of these springs, I broke a thermometer and thus failed. The temperature of the air was 84° in the shade. Humboldt states, that when he was there the water was 81° and the air 83°.* So that these evidently are not thermal springs; an additional reason for sup-

* Captain Cochrane, of the Sappho, made the temperature of the water 84°, and the air the same.

posing them to originate from chemical action, at no great depth.*

* In *The Cosmos*, Humboldt calls these mud volcanoes "Salses," and classes them among the results of pure volcanic action: he states, Vol. I. p. 225, "Mud volcanoes after the first violent explosion of fire, which is not perhaps in an equal degree common to all, present to the spectator an image of the uninterrupted but weak activity of the interior of our planet. The communication with the deep strata, in which a high temperature prevails, is soon closed, and the coldness of the mud emissions of the 'Salses' seems to indicate that the seat of the phenomenon cannot be far removed from the surface during their ordinary condition." Again, "The gases that are developed with loud noise differ in their nature, consisting, for instance, of hydrogen mixed with naphtha or of carbonic acid, or, as Parrot and myself have shewn (in the Peninsula of Taman and in the Volcancitos de Turbaco in South America), of almost pure nitrogen." That the gas now emitted is not nitrogen, I can assert with confidence, having breathed it without any effect on the lungs, and Gen. St. Anna's chaplain, a gentleman of some scientific acquirements, told me he had himself often burned the gas, and considered it to be pure hydrogen. He has also informed me that there are other volcancitoes similar in character about ten miles from these, and that the gas there would also burn. In Humboldt's sketch the cones of disturbance are shewn much higher than they now exist, and the surrounding wood is composed of palms and other large trees; whereas now, nothing but aloes and low shrubs are visible. An old man (who stated he accompanied Humboldt to these volcancitoes) described this alteration as having occurred within his own recollection, and that the force of expulsion is not near so great as it was. It is evident nature is here changing her aspect: aloes have replaced palms; so pure hydrogen or carburetted hydrogen may from its ascending powers have interfered with the respiratory organs (the leaves) of a lofty vegetation, and in replacing nitrogen encouraged a lower grade of development; or from the absorption of carbonic acid and ammonia by the emitted water, the succulent portions of plants have been more encouraged, and a consequent gradual change in the class of vegetation has taken place. The chemical

We remained at Turbaco until late in the afternoon, and then rode into Cartagena. At the first fortification we met the Governor, and after answering a few questions regarding our trip, we once more entered the California Hotel. Next to our room was a poor Frenchman suffering from chronic dysentery, which a few months' residence at Chagres had fastened on him. The poor man was evidently in the last stage of existence; we offered any assistance and consolation we could command, but human skill had to succumb to nature, and yesterday death relieved his sufferings. He had been previously removed to the military hospital—his last moments were attended by a priest and the vice-consul; the poor man was apparently anxious for death, and spoke quite calmly and collectedly when making his confession and settling the few worldly matters he was possessed of.—“Requiescat in pace.”

May 15th.—I was all day yesterday compiling “The Dique Navigation Report.” It is not easy

explanation is not easy, where even the cause is hypothetical, but it is not unreasonable to suppose that with the four elements, oxygen, hydrogen, nitrogen, and carbon, forming air, water and lignite, circumstances can occur which at one time would free nitrogen, and at another allow the escape of pure hydrogen or carburetted hydrogen. A more moderate heat, the introduction of some new element, such as sulphur or lime, or the final decomposition of a stratum, would create a change in the relative affinities, and thus cause new combinations, without any violent effect on the superimposed mass.

to describe engineering operations to people who scarcely know the principles of road-making ; and have no engineering works in the country to familiarise them with the most ordinary means employed in their execution. Correct statistical information regarding imports and exports, and internal traffic, it is very difficult to obtain, although the Government here offers me every facility to arrive at the facts ; from the data I have been able to collect, I feel sure that by proper arrangements a capital of £150,000 could be advantageously invested in perfecting the Dique navigation, and placing steamers on the Magdalena. The present traffic, it is true, is small, but it can still give a good return ; and the badness of the roads and the cost of conveying goods upon mules' backs for 75 miles act as a prohibition to the consumption of imported merchandize, and exports cannot reach any safe harbour except in the same way, for Savanilla, at the mouth of the Magdalena, is only an open roadstead, with no good anchorage within several miles of the shore. There are only three ports on the Atlantic which are in any way in connection with the Magdalena River—St. Martha, Savanilla, and Cartagena, the former is three days' journey from the nearest point on the river, Savanilla is at its mouth, and Cartagena 75 miles from it. If the Dique navigation was open, there

is no doubt Cartagena would have the whole trade of the provinces which the Magdalena flows through. The present population is over a million and a half, and their resources are not at all developed, chiefly owing to this want of a means of communication. At present to go from Cartagena to Bogotá takes from 22 to 25 days; the voyage from Calamar to Honda, where you take to horse, being done in a canoe poled up along the banks of the river, leaving you a prey to myriads of mosquitoes. The cost for one person is about £25; the value of the discomfort, and the risk of fevers, agues, alligators, and mosquitoes, depend upon the suffering powers of the victim. No one ever travels except under compulsion, and communication by letters is at long intervals and irregular. Is it to be wondered that well thinking men should look upon the opening of the Dique as a balm for all evils, and the germ of future prosperity? The Government is so fully aware of its importance, that it will, I believe, grant any thing, except money, to a company engaging to open this navigation and maintain it. I am not sure if it would not abolish customs, and make the Atlantic ports free. When I hinted at the probability of that being one of the conditions upon which English capitalists could be induced to invest in this matter, I was told such a thing would not be im-

possible, indeed, it had been mooted, in a proposition to abolish all indirect taxation and put on a property tax, on something like the principles advocated in a pamphlet by Mr. Thos. Gisborne comparing the taxation on *income* with that on *property*. If New Grenada takes such a step, she will be in advance of what is becoming the policy of England. Exports are now free of duty, and, except at Cartagena, the Custom House tariff on imports is so imperfectly carried out, that Santa Martha and Savanilla enjoy more smuggling than regular trade. It is for this reason that I consider it important for any "Dique" speculation, that all customs should be abolished, as otherwise the Company would have to compete with the transport of smuggled goods. Cheapness and quantity are generally allied in trade, so that a free port and an easy mode of transit are likely to increase the trade along the Magdalena very rapidly.

The other evening, whilst I was enjoying my cigar just before going to bed, I saw on the opposite balcony a number of young ladies, one of whom seemed covered with the most luminous brilliants. I found she had formed a necklace, bracelets, and brooch, with a number of fire-flies, which, I am sorry to say, she had stuck upon pins; notwithstanding their sufferings, they continued to emit their phosphorescent light for a long time, serving her vanity at the

cost of a lingering death. An American from "the States," who had never been to the tropics, in landing at Chagres on his way to California, exclaimed, on seeing a number of fire-flies, "Oh ! crackey, look at the lightning bugs."

May 18th.—Forde was yesterday compiling a topographical map of the country between Cartagena and the Magdalena River, from the observations we took on our excursion. I find that an old Spanish map lent to me is pretty correct as to the general features, but sadly wanting in the details. I have marked with numbers the places which I geologised, corresponding with the labels on the specimens. The Sappho sailed early this morning, before I had time to make up a box of these specimens, the map and a memorandum of the general nature of the country, which I intended to have sent to the Geological Museum in London—I shall have to send by some other opportunity. By barometric observations taken early this morning, we determined the height of the "Popa" Hill which overlooks Cartagena, to be 505 feet over the sea. This hill rises to the S.E. of Cartagena, and forms the summit of the coralline limestone elevation in the neighbourhood, Turbaco (550 feet above the sea) being the highest point of disturbance of the whole district. The Popa ridge runs 10° to the west of north, terminating abruptly in a cliff 10° east of

south. It gradually bends to the north of west, forming the island inside which the harbour is situated. The Bocca Grande and Bocca Chica have, I should say, been worn away by the combined action of sea water and land freshes, gradually disintegrating the soluble portions. Such a process is going on here in all the sea walls formed of coralline limestone, the wash of the water having in many places eaten its way two feet into the stone. Towards the south and south-east the land is very low, rising gradually up to the foot of Turbaco hills, not more than 100 feet in 12 miles. Coralline insects work up to water surface, and no higher; so that this large plain was probably laid dry by the recedence of the sea at the time the Popa, the Turbaco range, and the belt of islands to the seaward were raised; or perhaps, being an inland sea, the waters gradually made an opening through Bocca Grande, Bocca Chica, and the islands on the south coast, beating, in their descent, violently against the south face of the Popa, which would account for its abrupt termination on that side; on this supposition, the valley of the Dique formed the mouth of the Magdalena River, sedimentary deposit having eventually converted it into an alluvial plain.

On the top of the Popa is a monastery, once used as a nunnery, but now only as a look-out station for signalling ships. The chapel is still sought by a few

devotees, who have left emblems of their piety in the shape of crosses and niches cut into the solid rock. The view must be very extended on a clear day—this morning was unfortunately hazy with threatening rain, so that we had to satisfy ourselves with a bird's-eye view of Cartagena and its harbour.

There is a well at the monastery, and the water rises to within about 40 feet of the surface, about 30 feet higher than the *volcancitoes*. If elevation is taken as the measure of the disturbing force, allowing for the difference in specific gravity of porphyritic rock, coralline limestone, and the sandstone found near the *volcancitoes*, it would lead one to suppose that the same power produced all the terrestrial changes visible between the valley of the Magdalena and Cartagena, and the absence of the clays or oolites of the tertiary series, would fix the date of this disturbance prior to their formation. A fossiliferous examination of the specimens I have collected, will establish these facts with more precision than general deductions from isolated facts. Geological history is still so uncertain in its epochs, and argument by induction is so dangerous in the hands of an amateur, that I must warn any one from taking my conclusions as more than an isolated opinion formed on a very general knowledge of the subject. My object is not to prove a theory by exposing my own

ignorance, which so often occurs, but to collect materials sufficient for others to investigate the truth, and "*en passant*," I may be allowed to think for myself.

A letter was received yesterday from Dr. Cullen, in which he proposes being here on the 26th. The schooner I have engaged is being caulked and painted, and will not be ready until the 22nd; so I determined to wait for the English mail, due here the 25th, otherwise, I should certainly not have spent three weeks waiting for Dr. Cullen's arrival, as he was well aware we were to be here by the 1st inst.

I hear the most contradictory reports about the Indians on the coast of San Blas. The Captain of the port here, very kindly sent me a chart of Port Escoces, and hearing I had hired a vessel, recommended me to be off the bargain, as he knew the Indians would not allow me to land; in fact, that it is as much as my life is worth to make the attempt. The Spaniards had two or three forts on that coast, but were never able to penetrate into the interior since the Buccaneers destroyed the town of Santa Maria on the Savannah River; but these Buccaneers were fortunately Englishmen, so that the Indians have an hereditary liking to us, attributing their freedom from Spanish dominion to British valour. The skipper of our schooner has made inquiries from

every one who knows the coast (he is a West Indian) and the answer he always gets is, "Hoist an English flag and trade with the Indians, you may thus obtain leave to make an excursion into the interior." They are evidently of a friendly disposition, but jealous of an invasion, so that I hope they will give one a friendly hint to be off when our presence becomes disagreeable, and not first shew their displeasure by a flight of poisoned arrows, as chronicled by Wafer, and other historians. An instrumental survey seems to be out of the question, so that our levels, theodolites, sextants, and chains, will probably remain packed in the same box Troughton and Simms consigned them to, on our departure from England. I hope a mountain barometer will not look suspicious, or cause the apprehensions which Punch has chronicled, a "dumpy leveller," and a sapper, produced in London upon an old lady with a large umbrella. If I can get across the Isthmus, and obtain one good set of barometrical observations of the height of the summit, I shall feel satisfied that my Darien trip has not been "a wild goose chase." Forde objects strongly to being left on board taking hourly barometric observations, whilst I am trying to get one squint at my barometer in dread of the policeman's hand on my shoulder with, "Come, be off, none of that sort of thing here." He says he will be

ashamed to shew his face in Ireland if he does not cross the Isthmus once, at least. I console him by hinting "*that once*," might be once too often.

We are not the only representatives of the profession. There are several other sets of engineers bent towards the Atrato line or the Chepo River, and one gentleman has a roving commission between the Atrato and Panama; but when Darien is mentioned a certain solemnity pervades all—"I don't know about that;" with a slow shake of the head, expressing a volume of doubt, or rather an octavo of certainty. I have read and listened about Darien Indians, their cruelty and jealousy, until I am callous and unbelieving; but it frets me to remain in doubt, ebbing out an existence at Cartagena. The difficulty of obtaining a vessel for this service has, I must own, rather shaken my confidence of success; more particularly, as upon *no terms* can I get any one to accompany me into the interior.

The great provision trade to Chagres, or rather Navy Bay, the terminus of the railroad in progress of formation, gives full employment and large profits to the owners of the coasting vessels, so that they do not care to run any risk for the sake of a few hundred dollars more profit.

Troops of labourers are constantly on the way to Chagres to work at the railroad, they are paid their

passage and receive four dollars (sixteen shillings) in advance, with a mat and blanket. On their arrival they are paid a dollar a day and supported, or one and a half dollar a day, and they find their own living; after a few months they generally return with their gains, which they spend in luxuries and baubles, and then degenerate again into indolence and a sheer existence, or sometimes go back to Chagres to repeat the same process, or leave their bones to whiten with those of hundreds of others who have fallen victims to its unhealthy climate. The high price given for labour does not command half the number required for the work, and at the present rate of progress, supposing the funds to be available, this railway communication cannot be completed for two or three years.

May 19th.—As the barometric elevations we have fixed differ so much from those given by Humboldt,* Forde determined to prove the truth by a line of levels taken with one of Troughton's "dumpys." He started at cock-crow this morning and levelled to the top of the Popa. He made it 504·71 feet over the sea. By one set of barometric observations we made

* The error may be that of the translator, as I have taken the figures from an English version of Humboldt's "South America," published in Edinburgh. Perhaps the measurements are not English feet, although the text gives them as such.

the height 505 feet; by another set, 529. We took the first set of observations with a great deal of care, and with the best of the two instruments, the second set being only as a check upon the accuracy of the first. It is clear from the close approximation of the first barometric observations to the actual height as ascertained by levels, that in practice under ordinary circumstances of the atmosphere, simultaneous barometric observations may be depended upon to within ten feet at the outside. The boiling water thermometer, when tried upon the Popa, varied from $211^{\circ} 30$ to $211^{\circ} 45$, in consequence of the fire not being steady; the higher temperature was obtained by fanning the charcoal, and remained steady as long as this was continued; as soon as the fire was allowed to burn without an extra supply of oxygen, the thermometer went down to $211^{\circ} 30$: in calculating the height, I took the mean of these two readings, thinking that the quick evolution of steam produced by the greater heat may have caused a disturbance in the atmospheric pressure, from the rapid bursting of the bubbles on a small surface: the pot used is part of an inverted cone, widest at the bottom. On my return here I put two different sized vessels on the same fire, and found that when the water in both

was apparently boiling, though not with equal intensity, the temperatures differed nearly a whole degree, clearly proving that the fire was not sufficient to keep all the water in the larger vessel boiling, the steam bubbles being emitted from that nearest to the heating power. Taking, therefore, the highest reading at the Popa, instead of a mean between the two (the intensity of the heat at $211^{\circ} 30$ reading being insufficient to keep all the water boiling together), the resulting height would be 497 feet,* presuming the room in the Hotel to be 30 feet above the sea, which, although a guess, cannot be far from the truth.

The boiling point thermometer is not near so delicate an instrument as the mountain barometer, nor is it to be depended on for the same accuracy. It is useful as an approximation and a rough check on barometric observations, if taken simultaneously with them, but it offers no facilities, even in carriage,

* Boiling point therm. on Popa top, $211^{\circ} 45$

Ditto at California Hotel, $212^{\circ} 30$

0.85

At 549.5, ft. of elevation for 1° temperature

Elevation for $0^{\circ} 85$ 467 feet

Elevation of California Hotel over sea, 30 feet

497 feet

which should recommend it to the profession. The danger of breaking it, the difficulty of using a magnifying glass to read the decimals, from the condensation of steam on the lens, and the trouble of obtaining water, or having it to carry, and then lighting a fire under disadvantageous circumstances, are objections which its slightly more portable qualities cannot compensate. Newman's mountain barometer made of steel, with a cast iron cistern instead of the leather bag heretofore in use, is quite light enough to sling on one's back in a leathern case, and will bear a deal of rough usage without injury ; but I would recommend every one to take a set of light triglyphs, or else a small gimlet to fix into a tree, and let it hang by the ring, as it is impossible to secure perpendicularity or steadiness by trusting to the hand for its support ; also after inverting it, and between every reading, three or four minutes should elapse to allow the mercury to steady itself to the pressure of the atmosphere.

Ulloa, in his description of Cartagena, gives a list of maladies indigenous to it, which, if true, ought to have depopulated the town years since. I do not believe it is at all more unhealthy than most cities in a low situation ; and I feel quite sure that if in Europe the inhabitants smoked as many cigars, took as little exercise, and imbibed as much bad rum and

worse "anidou," they would suffer in health much more than Cartagenians seem to do; neither is the heat as intolerable as I supposed. The thermometer ranges from 80° to 85°, sometimes as high as 90°, and once at Calamar I saw it 95°; but during some part of the day a breeze is to be felt, and as all the better class of houses are constructed to create a draft, indoor occupations can be followed without much inconvenience.

House flies, mosquitoes, sand flies, ants, and horrible smells, do certainly divert one's attention considerably from the book or the pen, but with habit these pests become mechanical in their effects, and scratching and writing can be carried on simultaneously; carrying out the adage that the right hand scarcely knows what the left hand is doing.

I would strongly recommend all fastidious tastes to be carefully locked up in the stronghold of English luxury, before determining on a voyage here, more particularly as regards cleanliness and meals. When in your room the dust of years becomes unpleasant by flying about with each puff of air, a sprinkling of water on the red brick floor corrects the evil. The internal yard or square receives all the sewage of the premises, with generally on one side an underground cistern for the house water. Ducks, hens and flies dispute with each other the right of

garbage ; the latter, however, have a great advantage in swarming to the dinner or breakfast table as soon as it is laid, sharing with you upon your very plate the oily and well garlicked viands which are provided, and then perching upon your nose, your forehead, or your hands, regardless of any thing except a cigar you smoke in self-defence, that causes thirst, so that weak brandy and water, or "vino tinto" (a species of vinegar claret) become a necessity ; plain water being unpalatable, as well as unhealthy. The other day we sat down fourteen to dinner (a sort of table d'hôte). Five were in shirt sleeves, one (Forde) in a flannel blouse, and all but two without waistcoats. A carving knife and fork is considered a superfluity : every one's fork is in every dish, and half the knives run a good chance of being swallowed. Water melon and pork chops, bananas and poached eggs, are indiscriminately associated on the same plate. About ten minutes constant munching suffices, and leaves empty dishes. Cigars immediately follow ; indeed, one Spaniard, with most brilliant green spectacles, and faced like an exhumed subject who had died of small-pox, smokes all dinner time, laying the dust most effectually in his neighbourhood. He is an apothecary, and must be a clever fellow to have kept himself alive so long. As a sample of the extortion practised upon strangers, I can mention that I got

twenty-four plain blue pills made up from a receipt ; the charge was six shillings—a native of Cartagena would only have paid as many pence. Such things happen, however, everywhere on the European continent, so that South America is “no worse than its betters” in that respect. Take it all in all, if circumstances obliged me to live in Cartagena, I have no doubt the necessity would create many sources of enjoyment which I have not yet found out. People are civil and obliging, and, I believe, socially inclined ; the country is picturesque, and interesting to the philologist, as well as full of game for the sportsman ; besides, the English steamer touches four times a month, and there is the excitement of expecting letters, and the pleasure of answering them. A stray frigate sometimes anchors in the harbour, and an exchange of civilities, with a chat on English politics, and a read of an old ‘Times,’ forms an epoch, and breaks through monotony. Grenadian politics are always at a premium. First, the President and Governors of provinces are re-elected every four years, and threatened with losing their places every few months. The Red and White Roses were never more antagonistic and extreme in their acts than politicians are here. An unpopular measure always denotes a revolution ; a change of government means the expatriation of the deposed. The present

Governor of this province was for five years a refugee in Jamaica, where he learned English; his predecessor is now ruralizing somewhere in the States.

General Flores, late President of the Republic of Equador, has collected an army, and threatens to invade New Grenada, so as to place it again under Spanish rule. The House of Assembly have, consequently, voted a forced loan of 2,000,000 dollars, and 20,000 troops. Where the money is to be got has not transpired, but the soldiers are kidnapped Indians, or negroes, tied in pairs, and marched to headquarters, where a little drill, a musket and a cartouch box, equip them for service. Our own Jack tars were not more unceremoniously treated in war times than are these citizens of a republican government; shewing how, with all our boasted civilization, we are in many respects behind those nations who, having lately fought for and obtained their own independence, have still to contend against poverty in the revenue, an unstable commerce, and the unbalanced spirit which always follows great constitutional changes. Rome was not built in a day, and New Grenada must go through many lessons of self-examination before she can develop her resources, and compete in the mercantile race with other nations. Roman Catholic countries are generally intolerant, both in politics and religion. As far as religion is concerned, this is

an exception, and it is to be hoped that politics are also gradually becoming a fair subject of discussion, instead of the test of power to annihilate opponents. It is much to the credit of the country that most liberal concessions and privileges are given to foreign capitalists, and every possible encouragement and protection afforded to their investments. No wiser course could be pursued, more particularly as the country itself is burthened with a debt of seven millions of pounds, yearly on the increase, from the impossibility of meeting with punctuality the interest it bears. A few years ago all taxes on "exports" were abolished : the next step must be to reduce, if not annul, those on imports. The difficulty is to establish any other source of revenue. A direct property tax, which is the most equitable, is also in such an extensive country the easiest to evade, and most difficult to collect. A good deal of the Indian population is almost nomadic, and how could bamboo houses and uncleared forest pasturage be valued and taxed? Crops and stock might be, but such a system is objectionable in principle, as it burthens industry, as well as the result of industry, and would stimulate indolence. In Ireland the tenant farmers and cottiers were always set down as an unimproving race, because whenever improvement appeared the rent was increased, the non-logical

argument being used that the land must be too cheap where the tenant made more than his neighbours. A house tax would in a few provinces command a large and certain revenue, and would in reality be much lighter upon the town population than indirect taxes upon commodities, as the increase of trade, certain to follow the abolition of customs, must improve house property, and circulate more capital among the mercantile men of all classes. Of all taxes, a direct appeal to your pocket is the most odious in form, although, perhaps, the most equitable, and in a country like this, where among the lower and middle classes personal vanity and an assumption of independence (by which I mean freedom in its most extended form) are remarkably developed, the difficulty would be tenfold. Still, however, the experiment should be tried, and if persevered in for one or two years, the mercantile interests would prevent any re-imposition of duties, and a direct taxation would gradually be submitted to.

May 20th.—This is Ascension Day, a great holiday in the Roman Catholic Church, and cracked bells have been tolling all morning. The Cathedral appears to be the scene of one continual service. It is a large building, with no pretensions to architecture, being whitewashed inside and out. A few pictures of saints and scriptural subjects adorn the walls, but the only

thing really worth examining is a marble pulpit, sent by some Pope as a present. It is composed of various coloured marbles, inlaid like mosaic, with beautifully finished basso-relievo figures in white marble; both taste and execution are in perfect keeping, and it is worthy of a better place. Just before leaving England I went to morning service at Rochester Cathedral, and must own that here the sing-song monotony of twenty-four priests repeating the same Latin words, reminded me of the intonation and other mummeries of our own cathedral service. In both it was evident that not only the choristers, but the clergy themselves were acting a part, and repeating a lesson, with their attention fixed on anything but spiritual things. The Roman Catholics have this advantage, that all the clergy assist in the service, or at least take a part in it; whereas, at Rochester one parson intoned through the morning service, read the lessons, took a share of the singing, and preached a sermon, not one syllable of any of which could a stranger to our Church service have understood. Four or five other dignitaries were in their stalls, but they acted as mutes on the occasion.

I had not been to Cathedral service since I left Durham University, where there certainly was a fairer division of labour, and more intelligible language. I used then to be rather impressed with the

solemnity of the proceedings ; and knowing that some of our best divines and scholars* mounted the pulpit and controlled the discipline, the mind overruled conclusions made on the outward form only. Except at Rochester, I never but once heard a sermon delivered with a white surplice, and that was by a radical, half-cracked curate, in a church not far from Barton-under-Neadwood. There is no Protestant church here, nor of any creed but Roman Catholic, yet I believe all religions are tolerated.

The priest's dress must be as hot as it is unsightly ; a black surplice covers a velvet jacket, cloth breeches, and cotton stockings, and the hat is like two coal-scuttles set end to end. It is a black, heavy looking head dress, nearly two feet long (fore and aft), with the sides violently turned up. Men of all colours are eligible to the office of priest, and the contrast of snowy locks and woolly heads strikes a stranger as an incongruity in the celebration of their otherwise formal service. The Republic is, however, true to its name in this respect, all shades being admissible into every public office.

It is remarkable that politics generally follow the gradations of skin. A black is a democrat ; a pure

* The present Archbishop of Canterbury, the late Bishop of Durham, Dean Jenkinson, Dr. Townsend, the late Rev. Thos. Gisborne, &c.

white a conservative. But as colour marks its origin for several generations (some say five), so political opinions continue very tenacious wherever a cloudy shade is observable. All say that the coloured population is on the increase, which is natural, considering that only one class of parents increase the white population, whilst the intermarriage of whites, negroes, and Indians, with all the permutations, leaves the stain of the darker dye.

Some of the pure Indians are a fine race of men, and the women have magnificent raven black hair. Their complexion is dark olive, with regular features, dark and brilliant eyes, and generally beautifully formed hands and feet. They are very precocious, and soon dwindle into old age. Ulloa says,* “Nothing is more surprising than the early advances of the mind in this country; children of two or three years of age conversing with a regularity and seriousness that is rarely seen in Europe at six or seven, and at an age when they can scarce see the light are acquainted with all the depths of wickedness.” He evidently makes the mistake I did about the visual organs of new-born babes. But Ulloa wrote nearly 100 years ago, without much chance of contradiction. He must have been clever, as well as original in his ideas, for the scientific expedition he was attached

* Page 34, Fourth Edition, pub. in 1836.

to was the first that measured the length of a degree of latitude at the equator, and gave much valuable information by instrumental observations.

The Spaniards, it must be owned, managed their topographical surveys very well, and their maps are to this day the standard geographical documents of their late possessions. Many of the charts have wrong bearings and soundings, marked for the purpose of deceiving others; but there is generally a key to the error, known to their own navigators, and in some instances detected by more recent surveys. With the exception of the Isthmus of Darien, I believe the authorities here have maps of all New Grenada on a good sized scale; but the San Blas and Mandingo Indians have never allowed an examination of their country, nor is there a single verified instance of any one having succeeded in crossing this Isthmus from sea to sea. I except the Buccaneers, whose accounts are so vague and unsatisfactory that it is impossible to trace their route with any approach to accuracy. Their biographers themselves acknowledge the impossibility of defining their route on a map, in consequence of the detours their Indian guides made them take to prevent any local knowledge.

May 21st.—Yesterday, I met at dinner at the English Consul's, an American engineer, who is *en*

route to the Atrato, to explore it as far as it is navigable, and take lines of levels across the most favourable places between it and the Pacific. It appears that a Mr. Blagg got some years since a concession of this proposed inter-oceanic route; and the object of the present examination is to determine for what class of communication it affords facilities, whether a road, a railroad, or a canal. There are at present, therefore, five separate sets of surveys in progress, viz., the Tuantépeque, the Darien, the Panama Railway (in progress of construction,) the St. Juan de Nicaragua, and the Atrato. All these, except Darien, have been more or less explored, and their general features afford no facility for a large ship canal; so that their object is local, and does not affect the Pacific trade of Europe.

Supposing "Darien" to be feasible, it will require both diplomacy and a strong protective arm to treat with the hostile Indian tribes when operations are commenced. The Americans and English are in favour with them, so that a treaty may be made by them to facilitate the execution; but how is it to be guaranteed that the New Grenadians shall not take advantage of the footing thus obtained to encroach beyond the limits of the treaty, and thus become real possessors of a portion of their republic, which has never yet owned its dependence? Is

the Law of Nations a fallacy that fixes empirical boundaries to rights of possession which do not exist, acknowledging authority where no official red tape has ever dared to unfold its power? Why not treat with these independent Indian tribes as a nation, limiting New Grenada to the point where they themselves can shew any civic or military authority? If civilization demands that all savage tribes shall concede a portion of their territory for the advantages accruing to them from the introduction of Christianity and laws of plunder, spirituous liquors and demoralization, then is Darien as much open to its influence *from any source*, as was the rest of Central and South America when Columbia was first created a Spanish colony.

New Grenada has ceded to a private company a tract of land which it knows but as a mythological fable; there are, however, human beings who occupy this unknown tract, inherit it from time immemorial, have protected it successfully against one of the most powerful civilized nations of the day, and guard with great jealousy that one-tenth of the *legal right* which the proverb says possession does not give. Surely these are claims not to be disregarded by the two most liberal nations in the world, and one of whom has been always looked on as the refuge for the destitute and the protector of all the weak. These

Mandingo Indians are represented as most numerous, and their deadly mode of warfare in an unknown and naturally fortified country, renders it impossible to protect the executive in such an undertaking should they be hostile to it. If the prerogative of international laws acknowledges the supremacy of New Grenada in Darien, a treaty should be made with this republic to form it into an independent state, (like the Mosquito territory,) to be under the joint protection of the United States and England. Emigration and the necessities of the ship canal will bring in a revenue quite sufficient to maintain the rights thus established, and civilization will spread by contact, and not by *oppression*, as has been too often the case. These Indians are already a commercial people, a regular trade being established on the coast; and although jealous of invasion, they are represented as docile and friendly inclined. Should such a separate nation be established, it will no more be said that the "white man's footprint is the Indian's grave," and the nineteenth century will boast of having "done unto others as they would be done by."

This is really an important question, one in which the whole commercial world is interested; for supposing even the canal made, what security is there

for the transit of merchandise with tribes of inimical savages on each side.

Should New Grenada establish a government there I have no doubt at all that for many years life and property will only be safe under the guardianship of a strong military power. To whom is the Company to look for such protection? Not to the United States or England, because that would be infringing on the national rights; and not to New Grenada, for it has not the means, had it the will, to maintain such a force; and besides, why should it protect the property of aliens, from whom it derives no *direct* benefit? A treaty of neutrality will repel foreign aggression, or keep the home government neutral; but civil discord and internal strife cannot be interfered in without the expressed wish of the parties in power.* In such an universal commercial stake as an inter-oceanic ship canal, it is incumbent on all maritime powers to place this terra incognita upon such a footing that no internal jealousies shall

* This principle was acted on in 1846, when the democratic party got up a revolution and besieged Cartagena. An English man-of-war brig was anchored in the harbour for months without interfering, and it was only when the revolutionary squadron captured an English schooner that this brig opened her batteries, and single-handed mastered nine armed vessels. Captain De Courcy lost his command, but was promoted for his gallantry.

jeopardise the easy and safe transit of merchandise. If this canal is to be open to all the world, why all the world is interested in securing the privilege and maintaining it; at the same time, justice and reason demand that an independent race, possessing a country of their own, are not to be handed over to the power of those whom they have successfully prevented from conquering them. All rights fall to the ground by disuse, why not the right of governments, supposing such ever to have been established, in this instance?

May 22nd.—I have had put into my hands a map of Darien Isthmus, published in New Orleans by Dr. E. L. Autenreith. The interior is filled up with rivers and summit ranges, and as far as I can compare it with coast charts, it appears very accurate. It is remarkable that between the Gulf of St. Miguel and the Atlantic coast, the internal geography corresponds almost exactly with the rough map given by Dr. Cullen, and compiled, he says, from personal observation. This map is the only contradiction I have met to the many authorities who describe the interior of Darien as one unexplored region since the time of the Buccaneers, whose accounts are the only authentic ones of the Isthmus ever having been crossed by white men.

May 25th.—Yesterday, 'being her Majesty's birthday, Forde and I dined at the Consul's, and most loyally drank her health in champagne. I heard rather a good story about an American steamboat blowing up on the Mississippi, a thing of almost weekly occurrence. A widow claimed a life insurance for the death of her husband who had perished in one of these casualties, but the Company doubted the fact of the man having been on board the boat at all, and as only one person was saved, (a stoker) they thought it could not be established. Of course the lawyers had the settlement of the affair, and on his direct examination the stoker swore he had seen the man on the steamer, and knew him perfectly. On his cross-examination, however, they wanted to prove the contrary, and the following dialogue ensued.

Lawyer.—"Were you in the engine-room down below when the vessel blew up?"

Stoker.—"I guess I was."

Lawyer.—"And you say Mr. ——— was in the saloon."

Stoker.—"I reckon he was."

Lawyer.—"Then how can you swear you saw Mr. ———?"

Stoker.—" 'Cause when the smoke pipe and I was a going up, I met him a coming down."

Verdict for the widow with costs.

The English mails are due to-day, and wonderful to say the steamer has just been signalled ; she will not, however, be in for two hours, having to go round by Bocca Chica. I got a letter from Dr. Cullen yesterday ; he seems to have had a hard card to play with the government to obtain the Darien concession. They required a security *in cash*, that the works would be commenced in six months, the ratio of privileges being in direct proportion to the amount of ready money available ; and as no Company is yet formed, such an arrangement could not be made at once, so that the term of lease and other points of importance have been undefined for the present. There is no doubt, however, that if my report is a favourable one, and when a Company is formed, these difficulties will be easily got over.

Dr. Cullen promises to be here within a week ; I had made all my arrangements to go without him, but as his presence will be of great service, I have determined to wait ten days longer—then D. V. Cullen or no Cullen, I shall try what can be done with these unconquerable Indians. The Minister of War has obtained leave to sell all the New Grenada fortifications, although a few days before a credit of two millions of dollars, and 20,000 troops were voted to fight General Flores. Such contradictory legislation would appear paradoxical any where else, but

here it is explained by the impossibility to raise money. Fortresses and cannon are to be sold to pay for soldiers and their accoutrements. There are a great number of splendid bronze cannon on these fortifications, relics of Spanish dominion. They cannot have cost less than from £100 to £150 each, and I understand they could now be bought at £20 or £30. I have set some inquiries on foot, which will not improbably end in my purchasing them and shipping them to England as old bronze, if John Bull's present fever about national defences is over, and our Government will not buy them. Some of these cannon are 150 years old, and yet the ornament on them is as sharply defined and as perfect as the day they left the foundry. The weight of each gun is marked on the trunnion in Spanish pounds. They consist of 18, 24 and 48 pounders, and a number of mortars, altogether there must be over one hundred. The iron cannon offer a great contrast to the bronze ones. The constant high temperature of the atmosphere holds such a quantity of vapour in suspension during the day and precipitates it at night, that oxidation proceeds very rapidly, and dozens of these guns are completely eaten through with rust. During the last twenty-four hours the maximum heat was 87° in the shade, the minimum $81\frac{1}{2}^{\circ}$, and the dew point (or amount of heat necessary to condense vapour) 79° .

In Northern Asia,* with a temperature of 75°, Humbolt states that the dew point was only 24°, shewing the extraordinary dryness of the atmosphere, with (if heat is taken as the measure of evaporation) nearly the same absorbing power.

The mails are delivered, and no letters for me. Forde has a host of them, all in ladies' handwriting, and he offers to sell me the read of one from his sister. I hope she may see this, and never write to him again. The last mail only brought me a short official note, stating Captain Collinson was not coming out; this mail brings nothing. It is evident my friends look upon me already as past hope, a matter of history; and are daily expecting my posthumous memoirs. I must go to the consulate and console myself with the "Times."

May 27th. — Historians say that at Cartagena and all along the Panama coast, the rainy season sets in, in April, and continues until November. I have been here nearly a month, and have only seen two showers. To-day the sun is shining so hot and bright, that sight is dazzled and perspiration profuse—there is not a breath of wind, and although the thermometer is only 87° in the shade, one feels boiled and breathing as in an oven.

* Cosmos, vol. i. p. 334.

The rainy season is a comparative term, and as it never rains between November and April, the first general shower fixes the commencement of the change. I believe that until August there is no rain which renders travelling unpleasant, or the roads impassable—the summer of St. John, as it is called, commences about the middle of June, and lasts six weeks; during that time but little rain falls, and the heat is modified by clouds. Every night the eastern horizon is illuminated with lightning, sometimes low down in regular sheets, at others in fitful flashes playing round the edges of dark clouds twenty degrees above the horizon. Thunder is seldom heard, and the stars shine brightly all the time in a serene sky. This evening electricity is, I believe, peculiar to tropical regions, and is connected with other meteorological causes which, from want of a continuity of observations, have not yet been satisfactorily explained. Magnetism, electricity and galvanism, have been proved to be different states or stages of the same power, the Newtonian theory of *attraction*, and the known magnetic power of *repulsion*, are explicable by the polarity or negative and positive state of the bodies acting on each other. I was much interested with a work published by Mr. Hopkins, the present Secretary to the Geological Society, in which he

propounds a theory that a constant magnetic current is passing through the centre of the earth into the North Pole and out of the South one, and by this one power he explains the various magnetic, electric and gravitic phenomena, whose irregularity and incongruity he attributes to the disturbing power of the atmosphere in its various stages of humidity or rarefaction, and the cross currents caused by ascending and descending vapour. The dip of the magnetic needle (its vertical disturbance), its declination (or horizontal variation from the true polar axis), and the intensity of the force are all assimilated to this theory, and so is the Aurora Borealis. The number of magnetic experiments are not yet sufficiently extended under different zones to prove or disprove this ingenious generalisation of causes, nor do I remember if Mr. Hopkins fixes any curves of equal effect for this one power; it is two or three years since I read the work, and it was brought to my recollection by some mining reports of this country, compiled from Mr. Hopkins' personal examination. I believe it was in relation with the direction of mineral lodes in South America that he first propounded this theory, connecting it, not only with ethereal phenomena, but also with those igneous forces about which geologists are still of two opinions, the



cause being only ascertainable through the effect, which is also supposed to be the true measure of the intensity.

Humboldt, through his representations, got the English and Russian Governments to establish a number of stations, for magnetic and meteorological observations, between the Caspian Sea and Calcutta, embracing Central Asia to the confines of China. Should Darien Canal be undertaken, a magnetic station must be established with a complete set of instruments. Colonel Lloyd, whose scientific researches are well known, has been appointed Consul in Bolivia, and has taken out several instruments for his own private use; but otherwise, the whole of the Western tropics are devoid of regular scientific observations, and this is the more to be regretted, as they would be particularly interesting to compare with those of similar latitudes in the Eastern meridian of Greenwich, as the variations and disturbance of the magnetic power would give a clue to those explanations of climate and moisture which under the same latitude gives regions where rains never fall, others of perpetual rain, some of an invariable temperature, others where the thermometer ranges from below freezing point to 90° in the shade.

Machinery and chemistry now render tedious

personal observations unnecessary: photographic paper rolled on a cylinder moved by clockwork, receives the impression of the slightest change in the thermometer, barometer, and other magnetic and meteorological instruments. A curve of variation is traced, of which any number of copies can be taken and transmitted monthly or daily to other observatories, without the chance of a clerical error. One can picture to oneself a room in which a number of cylinders revolve, regulated by a chronometer, and receiving with unerring exactness the instrumental indications of those slight but constant changes of the atmosphere which, though imperceptible to our own senses, we have the means of recording, classifying and comparing, and finally deducing a law, a deviation from which throws light upon some other cause whose power is not yet understood, and whose intensity has not yet been measured—a meteorological loom in which the web of time is spun with the present for a pattern. Photography has brought a new era into the continuity and accuracy of observation; by elongating shadows the abscissa of the curve can be plotted to a distorted scale, and thus microscopic changes made sensible. Nature is painted through her own looking glass—and where a misty veil hangs over her more minute impressions, the colours are brought out in brighter hues, through

artificial means, to conform with the capabilities of our dull senses. Before this century has closed, electricity will replace the pen, if not guide articulation, and will convert night into day; all that is wanting for the former, is to make an instrument sufficiently delicate to indicate waves of sound; and for the latter, one that will preserve an uniform intensity in the evolution of electric light. The transmitting power is already curbed to the hand of man; does nature afford no means that will measure it with greater refinement and guide it with more delicacy? He will be a bold man who denies it does.

May 29th.—The Bogota Mail has come, with no letters from Dr. Cullen,—so that I hope he is *en route* to join us. If other virtues are akin to patience, they must have been established specially to try one's temper, and keep expectation on tip-toe. Our delay here is not only a personal inconvenience, but is of serious importance to the undertaking, as every day brings more rain, and adds to the difficulty of exploring a country covered with a dense forest—besides, health is an important element, and it is these alternate down-pours and sunshine that raise miasma and cause agues and fevers. I begin to agree with the American Engineer who told me, "No one can count too slow for this country."

Everything here is "Mañana" (to-morrow.) Three sentences cannot be heard without its occurring at least once, and it certainly is practised in every transaction.

This is the last day of Congress, so that Dr. Cullen cannot have anything to delay him after to-day. He can easily come from Bogota in ten days; it is not improbable that we shall not leave this before the arrival of the next English mail, due the 10th. I can scarcely even calculate these delays, they go so much against the grain. If, on arriving, I had the least notion I was expected to dance attendance at Cartagena for a month or more, I certainly should have been at Port Escoces three weeks since, and now either on my return, or where Dante says :

"Perdete ogni speranza o voi ch'entrate."

I would run that risk sooner than be in this transition state of purgatory. I cannot remember if the "Divina Comedia" puts down "hope deferred" as one of the punishments, except under the general term of "ungratified longings." It is a refinement of cruelty to the mind, as great as the Conte Ugolino suffered in body on the earth, or revenged himself with in "Hades."

The word punishment reminds me that I have

forgotten to mention the prison and its occupants. Under a portion of the fortifications called the Esplanade there exist extensive vaults, originally intended as stores for ammunition and war accoutrements. Each vault is about 50 feet long, 18 or 20 feet wide, and 10 feet high at the apex of the groins. The only entrance and light is through an iron-barred door. From 20 to 30 couples of prisoners, chained two and two, live here in an atmosphere polluted by every imaginable filth, and enclosed within damp walls of that green and mouldy hue, so characteristic of ill ventilated underground dungeons. Neither beds nor straw are provided, but those who have friends, or who can afford it themselves, buy a mat, and such other little necessities as come within their means. This chain gang is sometimes marched out to work. Their heavy clanking chains, fastened at the ankle and round the waist, and their "Siamese life," must render existence a burthen—a perpetual misery, more felt than solitary confinement in the new prisons of England, where cleanliness and pure air are at least afforded. This gregarious sort of life in duplicates must be very demoralising, and instead of reclaiming the victim, steepens him deeper in sin by blunting every feeling.

I saw one day a very fair and handsome young

man chained to a sturdy negro. He is imprisoned for being connected with one of the revolutions of the country, and has fourteen years of his term yet unexpired. He is of good Spanish family, brought up in luxury, with the education and civilized habits of his station. What a contrast to his present position ! His sentence is, I dare say, deserved ; yet humanity shrinks from contemplating such a picture.

The fortifications cost sixty millions of dollars (£10,000,000 sterling). When the account was presented to the then reigning King of Spain, he asked "if the streets were paved with gold;" and well he might, for a more extravagant absurdity never was perpetrated by a monopolist government. The class of work is admirable, both in design and construction, particularly on the west side of the town, and that facing Bocca Grande. There is a concrete pavement or "Beton," made from coralline limestone and sea-shore pebbles, which I never saw equalled ; some of it is as smooth as "asphalt;" other portions resemble the conglomerate known as "plum-pudding stone," and consisting of every sort of pebble cemented together with calcareous matter and oxyde of iron. In breaking a piece of the latter, the cleavage went through stone and cement indiscriminately ; some of this pavement is nine

inches thick, and shews no joints, having apparently been run in hot, or spread out before it had time to set. It is enclosed by small brick walls, which separate it into large squares, some fifty feet each way. Great attention has been paid to surface drainage by turning channels which discharge into sewers, or accumulate their waters in underground reservoirs. Nearly all Cartagena is supplied from reservoirs, which are filled during the rainy season. The limestone substratum it is built on tends to preserve the water, and I have been told that it is palatable and wholesome after being kept in that way for two years. When on the Popa I observed a well, and made some comparison between the height of the water in it and the volcancitoes near Turbaco; I believe the well is, in fact, a reservoir, so that I might have spared the argument about its level. It may be both a spring and a reservoir, for they say it is never dry, and I do not think it can alone supply the look-out man and his family during the dry season.

The revolutionary party had possession of the Popa in 1846, and with two cannon and a mortar managed to knock down three houses in Cartagena in as many months. I understand no one was hurt; but my American engineering friend tells me "they went near injuring a cow in calf, and frightened the

vultures from that quarter of the town." They themselves decamped, after Captain De Courcy, in a *three-gun brig*, took their blockading squadron, consisting of nine armed vessels.

There are supposed to be 300 soldiers in this town, and rations are provided for that number; but I understand 120 is the outside of what are actually on service. Every morning and evening we have the advantage of seeing guard mounted. Two drums, a fife, and sometimes a french horn, play martial airs to four soldiers; at night, a lantern (as large as a street lamp) is stuck into one of the muskets, and with a candle burning inside, looks like a perambulating light-house. There is a town band, and sometimes the spirited bachelors give a ball, when country dances, waltzes, and the old fashioned figure polka exhilarate the youth of both sexes, and as in Europe, lay the seeds of matrimony, or at least flirtation.

The other night I was kept awake for hours by some votaries of gaiety. The band commenced an old waltz, and after playing a few bars, turned to variations, which consisted of a simple transposition of notes; the air was then played again, and more variations, and so on, until the binormal theorem itself was a joke compared with the changes they rung upon a few notes. I had no notion music

could be so diversified and distorted without actually breaking through a sort of harmony, sufficient to make one recognise the time. If the wind of the musicians was any measure of the enjoyment of the dancers, the ball must have been a very spirited affair. What is called "being dressed" in this country, consists of a full suit of black cloth, and a black hat; white trousers are allowable during the day.

May 31st.—Yesterday was Sunday, and all the world from behind the desk and the counter appeared in their best suit. Patent leather boots are quite the thing; so are yellow kid gloves, and a very slight cane, particularly among the gentlemen of colour. Just opposite our room is the Californian Café, the fashionable lounge of Cartagena, where, on Sunday afternoon particularly, young men who study appearances and not comfort, smoke their cigars and drink coffee or chocolate.

When after dinner yesterday Forde and I went out for a constitutional, our straw hats and flannel jackets contrasted strongly with these exquisites, in whose opinion we must have fallen to near zero. We have had more than one hint that all respectable people in the town are particular about their dress; but where comfort is in question, an Englishman can

stand a great many hints and not take them. The ladies dress with good taste and great modesty; they do not convert their petticoats into balloons, so that, as David Copperfield said, "he did not know which was woman and which was dress," nor do they strip their shoulders half way down their back. I admire the simple arrangement of their dark and luxuriant hair; a flower or neatly placed ribbon is the only ornament, and neither high combs nor cork-screw curls disfigure the good shape of their heads. Their eyes and hands assist materially in conversation; all their gestures are graceful, and though perhaps they strike a "deshabitué" as a little affected, the feeling is soon got over.

Every house has a balcony; on these, towards sunset, the ladies congregate, swinging in rocking chairs, with a smile of recognition for every "signor" who salutes them from below. This is the fashionable hour for visiting, but as you are expected to go *dressed*, my circle of acquaintance is very limited. I once put on a black coat and up-turned collar, and neck handkerchief, but shall not do so again, as it is a sort of bath I do not like. Doing the agreeable under disagreeable circumstances requires a very pretty girl to render it endurable.

June 1st.—The first news this morning was a letter

from Bogota, stating that the Senate had granted the Darien concession on a lease of 99 years, agreeing to take £24,000 guarantee in twelve months.

Dr. Cullen has neither written nor appeared in person, and I am beginning to have my doubts whether he will do so.

An exploring party has just returned from Choco and the Pacific coast. Mr. Kennish, an Englishman, was seven months since sent by an American company to explore Darien, particularly about the Atrato and its tributaries, with a view of determining its richness as a gold district: with two others, he has been six months among the natives, having gone 200 miles up the Atrato, examining every tributary. He then commenced a land journey to the Pacific, across the place Mr. Blagg (an American) got a concession for last year, the term of which has just expired. The path lay through dense forest, with rising ground, until within eight miles of the Pacific, where he states the Cordilleras are several thousand feet high. With great difficulty he descended the precipitous western face of this range, and reached the ocean north of the mouth of the river St. Juan. There he got a canoe, and coasted for 22 days, when he entered the Gulf of St. Miguel, and put up at the mouth of the Rio Grande, with Messrs. Hassock and Nelson, the former a Scotchman the latter an

American. They have been some years settled in the country, and trade with the Indians.

One comfort I have derived from Mr. Kennish—he states he never found any opposition from the natives; on the contrary, they assisted him in every way, and worked willingly for moderate wages. He corroborates the general impression that neither Spaniard nor black man will be tolerated in the interior, but an Englishman is safe everywhere among them.* His account of difficulties and bad climate is very discouraging—they all had had innumerable fevers, and certainly look very pale and emaciated; he says no European can escape fever, and, though not generally dangerous, it prostrates all energy, and from its constant and regular recurrence enfeebles the system. He describes Chocò as very rich in gold and copper, and has, I believe, brought some specimens with him. His exploration has been the most extensive undertaken by any one; he encourages me to proceed, saying, “Rest assured no white man has ever crossed Darien Isthmus from sea to sea; your project has every chance of success—and if your health stands, and you take your time, difficulties will disappear by perseverance.” Poor fellow! his perseverance has given his constitution a great

* Mr. Kennish spoke only of the natives on the Pacific side of Darien.

shake, and nearly deprived him of the use of his eyes. He is a superannuated dockyard mechanic, and went to America to enjoy his pension: "There," says he, "there is no Sir William or Sir John to earn credit on your work; an artizan is trusted as much as any one, and if he shares the responsibility, he also shares the honour and the profit." A truism some of our naval architects will not acknowledge, even when a ship built by "Jonathan" beats one by "Sir William," and costs only half the money.

I have examined with care the charts I got from the Admiralty, and between St. Miguel to beyond Panama (on the Pacific) I cannot find any thing approaching to a harbour, or the facilities for forming one. The whole shore seems to be sandy, with only 1 and $1\frac{1}{2}$ fathoms in depth two miles outside low-water mark. At the mouth of the river Chepo, opposite the small island of Chepillo and the Gulf of San Blas (on the Atlantic), there may be some hopes of enclosing a sufficient area, and dredging out the bottom; but with shoal water all about, shifting sand and a 25 feet tide, it would be almost impossible to prevent it filling up.

This is the narrowest part of the whole Isthmus, and the summit range is close to the Atlantic; the height of it has not been determined, the San Blas Indians guarding their territory with great jealousy.

During the progress of the survey for the Panama railway, a staff of engineers was sent in a steamer to this Gulf. The Indians were considerably alarmed, and it was with difficulty any could be induced to go on board. At last the Cassique (a very old man) came with a number of his followers, and asked their intentions. It was explained to him the party wished to land and explore the interior; he said they would encounter many difficulties, and incur much risk from wild beasts, poisonous reptiles, fever, &c., and he strongly recommended them to abandon the notion; he told them there was no possibility of making a road across the mountains, and at last refused point blank to allow them to land. "We are quite contented," he added, "and do not wish to be interfered with—our requirements are few, and we have our homes and our hunting-grounds to ourselves; if we allowed the white man among us, all this would be changed, without any benefit to us." My informant (an American) added, "As the party saw there was a range of mountains several thousand feet high within a few miles of the coast, they abandoned the 'Exploration,' and went back to Chagres." A case of sour grapes I suspect.

Dr. Autenreith in his map calls the river Bayano, Chepo or Ravano, and extends its source farther east than it is shewn on the skeleton map I got at

Trelawny Saunders'. The general direction and latitude of the summit ranges agree pretty nearly all the way between Panama and the Atrato, forming an arc of a circle with a radius of 85 geographical miles, the centre of which is a little south of Galera Island, the southernmost of the Pearl Islands. At Panama this range is near the Pacific, gradually approaching the Atlantic at the Gulf of San Blas, until a little west of Port Escoces it is flattened at the apex of the segment, turning south into the Cordilleras of Chocò in the same way that west of Panama it meets the high chain of Veragua running parallel and nearest to the Caribbean Sea. If the direction of the Chepo and Chuquanaque river is produced up stream, they meet about five miles inland of Port Escoces,* and opposite to it; the northern limit of their hydrographical basins would form the tongue of land at Port Escoces and the north promontory of Calidonia Bay, extending into the Sassardi Islands.

At Panama it is ascertained that the lowest summit level is about 290 feet, and the whole range is broken into hills from 300 to 600 feet high. Port Escoces is placed under exactly similar physical and geographical conditions, being at the point of alteration (in direction) of the water-sheds of the country;

* Dr. Autenreith's map.

it may, therefore, be fairly expected to find there also a low and broken range of hills. It is known that the valleys of the Chepo and Chuquanaque are flat. Mr. Kennish went up the Chuquanaque to within 20 or 30 miles of its source, as marked by Dr. Autenreith, and the position he assigns to it agrees very fairly with that authority; he also affirms that the Cordilleras of Chocò lower as they turn westward, the summit between the Darien and the Atrato being over 1000 feet high, and that between the Pacific and the Napipi, where he crossed, much higher; they are probably again depressed towards the source of the St. Juan, where Humboldt was of opinion might be found the lowest summit between the oceans. As a geographical problem based upon general topographical facts, the solution may be fairly expected to be found somewhere between Calidonia Bay and the Gulf of St. Miguel, and between Chagres and Panama; the latter has been proved to be low, a still further argument in favour of the former.

There is no doubt this is the shortest line across, between any two harbours; and as they are of the first importance, and distance the next, the summit level becomes the only question for solving the engineering difficulty. The details necessary to design the works, and estimate their cost, are

important elements in the feasibility of a ship canal ; they affect the profits of the undertaking to the shareholders more than the utility of the project ; so that, as an engineer, I look upon them as of secondary importance, although, of course, it will be my duty to determine them as accurately as circumstances will permit.

As stated at the commencement of this Journal, I am satisfied no river in such a narrow neck of land can be of much, if of any moment, to an undertaking on so large a scale, and the probability is that natural water-courses will be avoided rather than followed, except where the supply for locks is got from, should such be necessary.

The greater the extent of country examined opposite to Calidonia Bay, the more useful will be the information collected. The first step (should I succeed in landing on the Atlantic side) will be to examine the shortest line between Port Escoces and the Savannah River, and then returning to the summit, follow the ridge east and west for a few miles, so as to be satisfied where the lowest point exists ; having determined the height by actual levels, if possible, or if not, by a number of careful barometric observations, it will be comparatively easy to fix upon the best valley towards the Pacific, as they can

be examined in canoes—a far quicker and more satisfactory mode of travelling than cutting one's way through dense forests. If I am not allowed to land, nothing remains but to go from Chagres to Panama, and from thence in a canoe to St. Miguel, and as near the summit range as can be got by water. Taking provisions and instruments all that round, and the time it will occupy, is a sad hindrance, particularly as we shall probably have to return by the same route.

June 3rd.—The Bogotá mail is due on Saturday, and the English mail on the 9th, so that, in consulting with Forde, we think it better not to leave until the 10th; that will give Dr. Cullen another post to write by, if he does not appear in person. I have generally made it a rule to keep my own time and actions independent of every one else; my departure from it in this instance will be a lesson to adhere more strictly to it in future. Talleyrand said, "Never do to-day what you can do to-morrow;" but he was a diplomatist: lawyers and they have a right by "usage" to procrastinate, and it was supposed the world could not get on without them. This fallacy is now understood, and the members of both professions have suddenly found their sanctuary invaded, and their darling monopoly in danger of losing its patent. "Time is money," has two inter-

pretations: the legal one is exemplified by a chancery suit, the practical one by commerce and compound interest. These cannot co-exist; so practice has got the better of law, and common sense is being substituted for technicalities and legal formulæ. Whilst Dr. Cullen is at Bogotá, dancing attendance on law makers, I am at Cartagena, dancing attendance on him. Catch me again doing Patience to the old lady with the scales miscalled Justice. I am ready to face Indians and snakes, tertian fever and ague; but when doomed to wait upon law and diplomacy, I despair: it is eternity in miniature, and not that eternity which we hope to attain.

June 5th.—Yesterday evening we took a stroll on the sea-side, outside the western fortifications. The Spaniards placed a row of large stones along the beach to prevent encroachments by the sea, and also as a barrier against landing in boats. These stones must have been transported with great labour, as some of them weigh over five tons. At the back of this artificial rocky foreshore a bank of shells, several feet in thickness, has been thrown up by the wash of the waves; the heavier particles of sand and gravel form a beach to the seaward. These stones are gradually getting coated over with calcareous matter and ferruginous cement, which attaches shells, sand,

and gravel to them, and in some places they are themselves formed into a conglomerate forty and fifty yards in length, and six or seven feet high. In course of years this barrier will consist of a continuous solid natural wall, and will present to the geologist a perfect example of the formation of those conglomerates so widely spread over some portions of the globe, and which at one time were supposed to have been all produced by igneous action. The Bocca Grande is filled with similar stones thrown round sunken ships, as a nucleus, if the same cementing process is going on there, which is more than probable, the difficulty of reopening this entrance will be much increased, as the barrier will be found to consist of a solid rocky ridge, instead of loose stones partially covered with sand and gravel. It is not often that nature tends to strengthen and bind together the work commenced by man; the process is slow, but not the less certain. It would be curious to see a breakwater built originally of "*pierres perdues*," gradually assume the character of solid masonry bound together with a natural cement as hard as the stone itself: such, I feel satisfied, would be the case on this coast, proving in this instance the superiority of a nearly upright face over the long slope which has been so much advocated for the seaward side of marine construc-

tions. The calcareous matter is, no doubt, derived from the soluble portions of the coralline limestone, and the oxyde of iron proceeds from the disintegration of the sandstone found at Santa Cruz and the volcancitoes, which underlies the coralline limestone in the bed of the ocean, and has been exposed by denudation. This sandstone contains from ten to fifteen per cent of carbonate of lime, and is close-grained and heavy. In a note I have taken of the geology of this neighbourhood, I consider it probable that these rocks belong to the, so-called, Peruvian formation; the coralline limestone being that known in the county of Durham as magnesian, and the underlying sandstone that found in parts of Germany as the lowest of the series, and overlying the coal measures. It is sometimes called the Lower New Red.

Should this classification be correct, it adds to the probability of the volcancitoes at Turbaco originating in carboniferous strata, as they lie at the outcrop of this sandstone on the summit of a ridge separated from the limestone by a valley of denudation. At some future time coal measures may be found at no great depth from the surface; at present the dense forests and thick coating of vegetable soil renders it almost impossible to trace with any certainty the change, or direction of stratification, more

particularly, as the intervening valleys are low and covered with fluvial alluvium.

June 8th.—Yesterday, Mr. Kortright had a letter from Dr. Cullen, in which he says he leaves Bogota, positively, on the 31st. It is dated the 28th of May, so that he ought to be here to-morrow, or next day; if he is not, the “*Veloz*” schooner will leave him behind. It is a fortnight since he wrote to me, saying he would leave in two or three days, all the preliminaries of the concession having been then arranged.

I went in the morning to pay a parting visit to the Governor. The Dique navigation engrossed a considerable part of the conversation. It is the stepping-stone to Cartagena’s advance, and if carried out in a proper manner and conducted with a reasonable toll, must eventually pay the projectors very handsomely. Nothing impresses one more with the necessity of easy means of communication, than the astonishing advances made in the United States. A new road, and every additional steamer, are the forerunners of new towns, new settlements, additional manufactures and prosperity, and in no single instance does failure occur. It is remarkable, however, that those States where negroes are scarce, advance with the most rapid strides; the slave districts being, in every instance, the last to “go a-head.” Sir Charles Lyell, who so strongly advo-

catcs the cause of the black population, acknowledges this fact, but hopes to see not only emancipation general, but looks forward to the social rise of this race by education, and a more equal footing with the whites. I must own, I am sceptical on this point, not that it can be denied that the negro by cultivation, can in two or three generations be greatly raised in the social scale, but, during that time, his contact with whites retards progress and stops the development of those energies which always originate with the more educated race. He is, at best, but an imitator, in a few instances, following the track laid out, but in most cases clogging it by his presence. The degrading position they have yet scarcely risen from, must influence the majority of their motives and actions, and make them feel their inferiority without the emulation to decrease it.

They have suffered from autocracy, so they naturally become democrats. Like the French socialists and the Irish ultra-party, they have nothing to lose, but much to gain by the subversion of the present state of things. I do not think that any one can say that here, at Hayti, or Jamaica, the introduction of negro blood into legislative assemblies and places of trust, has advanced the cause of progress. It certainly has checked the monopoly hitherto enjoyed by the white population, but with

what results ? by driving out of the country the only people whose interests are those of order, progress, and intellectual development. Eventually, no doubt, such a system will improve the race, and as people of colour acquire property and rank among their own class, they will become conservative, and it will be their interest to advance the position of the mass ; this will take two or three generations, and in the meantime, they will be three or four centuries behind those at whose expense such a state of things is brought about. The world is large, and a considerable proportion of it is uninhabited ; it seems more reasonable to let each race move independently. Why not encourage colonies of blacks where it can be done, without injuring established institutions ? If philanthropy demands an equal distribution of civilisation, it should, also, protect those who, by their own exertions, have introduced it into regions where barbarism was in existence a few years ago.

America and England have made great sacrifices in the cause of humanity, and at the present day it is an acknowledged fact that the best negro can only do two-thirds of the work of an Anglo-Saxon labourer ; as a question of competition, therefore, even in " unskilled labour," the darkies must be the lowest in the market. The slave states cannot compete with free white labour, they can therefore well afford to

sacrifice something to change their present system. If the Government assisted them by a cheap means of emigration, and some compensation for the capital they lose in their slaves, both parties would eventually benefit by the exchange.

It cannot be expected that a few years will make a complete change in the population of a continent ; but it would prevent the increase of the black population, which the mixture of races, and the exceedingly low morality of the negro women is now fostering. Physical science has proved that the brain of a full-grown negro is not larger than that of an ordinary white child. I doubt whether such would be the case if the negro had from childhood received the same education and mental training the white usually does, for I look upon mental and muscular development as dependent on practice ; the too rapid development of either being like forced exotics, short-lived and unnatural. Such an admission would appear to favour Sir Charles Lyell's plan of education in situ ; but it must be remembered that education is not only book learning, but the restraint of passions in every day practical life, which children associating with uneducated parents can never acquire ; so that three or four generations must be exempt from those civil rights and that equality in every branch of industry which it is so desirable to see, if it can be

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brought about without making the whites descend as well as the negroes ascend. There can be no doubt that as negroes increase, progress, both moral, intellectual, and worldly, is stopped, until, like Haiti, semi-barbarism again hold its sway; and as the black population must be multiplied in a triplicate ratio to the white (supposing there is no emigration in either), the time must come when all states that once had slaves will eventually be governed by their late servants. There can be no objection to that, if the change brings about only a change of power, as long as that power is applied as effectually in advancing civilisation; but I do not think the most sanguine philanthropist will maintain such a position.

On landing at St. Thomas, I was impressed with the degraded although independent position of the black population; my residence here has not removed that impression. Industry is looked upon as the curse inherited by man in his fall; and the road to competence, eminence, or distinction is not lightened by those feelings of duty and ambition which elsewhere have been nurtured by progress, and stimulated by example. The only portion of existence which offers any charm is indolence and independence of action and thought, if the impulse of a selfish passion deserves such a name. This cannot be wondered at;

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it would be unnatural were it otherwise, for humanity tends to extremes, where a control over oneself does not master the feeling. You sometimes see a dark skin covering an active mind open to improvement, and anxious to obtain it ; and also some whites are idiots ; the exception proves the rule.

I feel convinced that emancipation has lowered the negro both in worldly comforts and moral attributes ; what should have been a blessing has proved to be a curse, from having been done inconsiderately, and without some controlling power to habituate the slave to the exercise of those higher feelings which can alone keep in subjection the bad passions. A good doctor often keeps his patient in pain to effect a permanent cure. Only quacks and charlatans impose upon ignorance with universal specifics, and having cured one disease, leave behind a disordered system, or a broken constitution ; so did missionaries and enthusiasts work upon weak minds until they forced on emancipation, without any preparation for encountering so serious a social change. Calm reflection was put down as cruelty, where the life and happiness of tens of thousands of fellow creatures was concerned. As in all cases of public ferment, the object was considered a sufficient excuse for the grossest exaggerations, and where facts were deficient, invention was always at hand.

The cause of humanity and progress would have been far better consulted had the change been made gradual ; by encouraging education and moral restraint, and making freedom the recompense to those who shewed a disposition to fit them for self-responsibility and improvement, and not swamp their advance with a current of uncontrolled liberty. The deed is now done, and the only question is, how can the evil be checked with justice to all interests? Certainly not by levelling *down*, as well as levelling *up*.

There is no use in hiding the fact that in the West Indies and North and South America, the question of black or white population is becoming one of race against race, which, in a few years more, will be settled by numbers overpowering the few. We have seen one example of it already ; it is the pioneer of a more general movement.

The growing wish for self-government so distinctly shewn by the black population should be gratified before they wrest it for themselves : it can now be done by forming a few independent states like the Mosquito territory under the protection of European and American powers. In tropical climates, where existence is so cheap, and nature so bountiful, a few years would suffice to make such a country self-supporting ; and in the mean time,

nations who wish to get rid of their negro population could well afford to submit to a small tax for the necessities of a new country. I do not advocate a compulsory emigration where freedom already exists; I feel satisfied a large proportion of free negroes would take advantage of any opportunity which would raise them on an equality with whites. They have vanity and self-confidence most largely developed; the more educated would look forward to being senators or in positions of trust; the drudges would become farmers on their own hook; slaves would be free. It is an advance to all classes, and of the most taking sort, to gratify their foibles. In such a country secular and religious education could be based upon the most approved principles; the philanthropist would have a large field to cultivate intellect, and foster native talent; the progressive being could go ahead, the indolent one vegetate; soldiers and parsons, lawyers and mechanics, must be procured to work the state engine, and would open the door to the intellectual development of all countries. Small pay would be compensated by a showy uniform and a cocked hat; even titles based upon the usual merit they are awarded for, would be open to those enlightened and independent statesmen. Where would progress stop? Echo answers "stop."

June 9th.—The English steamer is already signalled

(8 A.M.), and we are anxiously expecting letters. Yesterday we asked a few of the friends we have made here to dine on board "The Veloz." The Captain is a Curaçoa man, and determined to exert the powers of his cook to the utmost. I had no idea what sort of entertainment would be provided, and rather warned my friends not to expect too much. There were seven distinct courses, consisting of:—
1. Soup. 2. Leg of goat (called mutton here), fowl, and hash. 3. Boiled fish with capers, salad. 4. Roast turkey, boiled beef, meat pie. 5. Baked tart, tipsy cake, sponge cake. 6. Boiled prunes. 7. Cheese, bitter beer, claret, champagne, madeira, liquors, coffee, cigars.

When I saw the second course, I began to fear my prediction of a famine would be true; and as we had sharpened our appetite with the row from shore, the dishes were removed empty. I had dined, and so had most of us, Captain Maal would however hear of no excuse, and course after course had to be tasted and the cook praised, until at last, when coffee appeared, we felt like the greedy boy in Punch, "as if our jackets were buttoned." The night was perfectly calm, and would have been very oppressive on shore. Venus, Sirius, the Southern Cross, the Great Bear, &c., shone in all the vividness of tropical beauty, and the deep blue sky shewed distinctly the

form of the higher grounds, and the outline of one of the finest harbours in the world.

On landing we were challenged by a sentry, (one of the National Guards,) and had to enter by a different gate from the one we were making for. It is the first time I have seen any interference, and I was rather pleased with the soldier-like manner the fellow presented arms and faced us when his first challenge had passed unheard or unheeded. There are four gates to the fortifications, but this is the only one guarded, being the principal entrance from the country, the other gates leading only to the sea-shore.

To-morrow will be a great Roman Catholic holiday, and a "Corpus Christi" procession is to march through the town. I hear that the balconies in the line of the procession will be crowded with the belles of Cartagena in their gayest costume. If I can look on without giving offence by being dressed in linen instead of black cloth, I shall certainly take advantage of the opportunity to judge for myself who holds the palm of beauty among the fair sex. I see by the official Gazette, published in Bogotá, that the Archbishop has been expelled the country. There has been a long controversy about the line of demarcation between ecclesiastical and civil powers. The clergy wish to keep an ecclesiastical court, the

whole patronage of their church, and the management of their property. The legislature has been gradually encroaching on this hallowed ground, and at last gave the appointment of curates, &c. to the President, and passed a law that ecclesiastics were to be subject to the common law courts of the country. The whole question has gone to Rome, in the meantime the refractory Archbishop is deposed and expelled. Should the Pope back his clergy, which is more than probable, and the Republic insist on its own privileges, New Grenada may become a refuge for our English High Church party, "a Roman Catholic ceremonial without Papal authority." There is some property in question, so that it is likely a compromise will be made; a shuffle in which the church will secure herself more strongly against being meddled with.

June 10th.—A grand church ceremonial has just been concluded; the procession of the "Host." I was not much impressed with either religious or sublime feelings. The mixture of colours, both in the races and dresses, combined with the faded pomp of wax candles, clergy, and images, made it but a short step to the ridiculous. A tinkling bell, a brass band, chanting, exploding crackers, jet black negroes in scarlet vestments, a company of infantry, and a heterogeneous mass of negroes, mulattoes, and whites,

arrayed in their best garments, made it difficult to see the religious part, or appreciate the intended solemnity. The balconies attracted my attention more than the procession, and was far more impressive to the senses. Well-dressed ladies, with sparkling eyes and beautiful hands, did not allow their features to assume the austere look of religious zeal. As the music, the images, and the clergy passed in review, the fans were often expanded, and whispering words conveyed a meaning which, if the expression of a woman's face can be believed, were nearer akin to Cupid than Catholicity. At several places the populace kneeled, and prayers were offered at impromptu altars; the fair dames would have soiled their bright muslins, or perhaps disarranged some portion of their finery by such an act of worship. They were being worshipped by various youths, so how could divinity kneel to deity. It was not to be expected, and their reverences will absolve them at next confession without much penance; I know I would for half the bright looks I saw levelled at others.

There go a coop full of chickens for the "Veloz." We were to have sailed this afternoon, but being a holiday the Custom House is closed, so we must wait until to-morrow; all the provisions and instruments are on board, and please the pigs we shall be also there early in the morning.

I see by the Times, that the Crystal Palace is doomed, but is to be rebuilt by private enterprise somewhere on the South Eastern Railway, and converted into a winter garden. John Bull is uncommonly soft to allow himself to be cajoled by a few house-building speculators. The House of Commons was evidently anxious to continue having the *entré* to Lady Somebody's and Sir Thomas Nobody's; and as it did not concern their constituents much, nor endanger their seats, they sacrificed the pleasure of the million to the gratification of the Rotten Row-ites—as if another Rotten Row could not be made in which the “haut ton” could shew off their equestration and their servility to fashion just as well—all that is wanting, are timber, rails, gravel, prancing steeds, and an expensive tailor; but it seems that since I left England, these have become scarcer than glass houses.

June 12th.—Anchored opposite Bocca Chica with a light breeze dead a-head, and the entrance is so narrow, we cannot attempt to pass. With a deal of hurrying, the “Veloz” was got under the stern of the Great Western steamer at 2 P.M. yesterday afternoon, and Captain Woolley most good-naturedly gave us a tow. About half way to Bocca Chica one hawser broke, and a mile further on the second gave way, and we were left to our own resources, and

minus the better part of the two strongest ropes on board. A light breeze helped us on to within a mile of the entrance, and there we anchored at nightfall. It rained continually during the night, with squally weather, and the mosquitoes, which came with us from Cartagena, kept us lively enough.

The "Veloz" is a brigantine about 120 tons burthen, carrying a captain, a mate, seven sailors, a steward, and two boys. She is low in the water, and looks rakish, so much so, that last year when she was painted all black, an English brig chased her for a slaver; there are six good berths, and the cabin is on deck, so that one is not smothered at night. She belongs to Curaçoa, but all hands speak, more or less, English; we have no pilot, because none would come, in consequence of its being known we intended to explore the interior, and they are afraid the Indians might revenge themselves on them as

Dr. Cullen is not with us; after waiting six weeks accessories; a comforting feeling for the principals. he has no reason to complain if the expedition succeeds or fails, without him. I have left a note stating my intentions, and if he chooses to follow, he can catch us either at Port Escoces or Navy Bay.

June 14th.—About 11 o'clock yesterday morning it fell calm, and the heat was intolerable. A heavy

swell kept us rolling from side to side, without adding to our progress. About 4 P.M. a light north wind sprung up, and we made four knots an hour until seven, when the horizon was darkened by heavy black clouds, with lightning and distant thunder. These signs of a coming squall made us shorten sail, and for two hours we watched with interest and anxiety the finest specimen of an advancing storm I ever beheld. As the clouds rose, small streamers preceded them, and their edge was clearly defined against the blue sky by white heavy looking forms, behind which the lightning played vividly, sometimes with brilliant edge, at others illuminating the whole mass, shewing the contour of each separate cloud. The thunder gradually pealed more frequently and at nearer intervals, until, at last, one almost simultaneous flash and roar, apparently right over our heads, was followed by a sharp gust of wind and torrents of rain, such as can only fall under the tropics. The war of the elements continued until near daylight this morning. About 9 A.M. it again fell calm, and here we are rolling without intermission in a glassy sea, whose long swell can scarcely be distinguished except against the horizon. The heat is unendurable, and mosquitoes most persevering in their attacks—mental exertion is oppressive—sleep out of the question. A Neapolitan Lazzaroni would even grumble

were he here, particularly, if he was distracted by the cries of two kids separated from their mothers, in hope the latter will give milk ; but, as yet, we have not benefited by their being of the genus "mammalia." As fresh meat is scarce, I shall vote for their being converted into mutton if they continue to refuse the food they were bought to give. At Cartagena all mutton is goat, and all lamb, kid ; I did not find it out until I inquired how it was the legs of mutton had so long a shank, and then the mystery was solved. I defy any one to tell the difference in the meat, when cooked with oil, onions, and garlic, and particularly strong of the latter ; our cook here has got a hint on the subject, and if he continues his evil practice, I shall throw all the garlic overboard, and thus make obedience a necessity, and not a virtue. There is no use in scribbling about eating and drinking, or complaining of a boiling point monotony, and I cannot think to write.

June 22nd.—The long gap in my journal has not been passed idly otherwise, but I must not anticipate. On the 15th (June) we anchored in Port Escoces, at half after four in the afternoon. The scenery is very fine along the whole coast, and high mountains appear to range uninterruptedly along the Isthmus ; however much I might have admired them under dif-

ferent circumstances, in the present instance I looked at them with a jealous eye, examining carefully each indentation or apparent break in their continuity, in hopes of finding a valley or gorge deepened by some torrent. Heavy clouds hung over the highest peaks, so that I had to be satisfied with a very partial view. The harbour of Escoces is partly exposed to the N.E. wind, but otherwise it is deep, with good anchorage, and accessible at all times. To the southward, the bay of Carreto with an Indian village, and to the north, that of Calidonia and a few huts, shewed the only signs of habitations. A few canoes were coasting about Carreto, apparently fishing, but none approached us.

The next morning, the 16th, we were up early, and Forde and I went aloft to see as much as we could of the interior. First, were a range of hills from 300 to 700 feet high, behind them came mountains, apparently over 1000 feet high; towards the S.W., in the direction of the Gulf St. Miguel, these mountains appeared to dip until they were lost behind the first range of hills, and I was therefore of impression, that these hills and not the mountains, formed the division of the waters between the two seas. In any case, they must first be surmounted, or the outlet of their valley found. After breakfast we rowed round the harbour and surveyed

the principal points with a pocket sextant. We landed at the mouth of a river, which evidently rose in the first range of hills, and ascended it for over a mile, until it became a regular torrent, falling over a soft sandstone, but containing pebbles of igneous rock. For about half a mile we cut our way through the wood with matchetoes (a short sort of sword), we had brought with us, and I found the task easier than I had anticipated, so much so, that as no Indians had come on board of us, I determined to start the next morning, and explore as far as the provisions we could carry would allow us. I got three sailors who spoke English to volunteer to accompany Forde and me, and that night we made all our arrangements for an early start.

I gave orders that the *Velo* was to wait at Port Escoces until the 3rd July, as I thought, if our provisions carried us over to St. Miguel, I could there get a fresh supply from Mr. Hassock, and return again. I did not expect, however, to be away more than four or five days, the chief object in view being to examine the summit range, or the division of the waters.

The next morning, at 7 o'clock, we were all ready, and left the *Velo* without being observed by the Indians, as appeared afterwards. Forde carried a mountain barometer, a compass, and a linen bag

with some small things in it. I had two plaids wrapped in an oil silk-cloak and slung over my shoulders, a bag with dressing utensils, and a few things out of the canteen. The rest of the baggage consisted of two hammocks, two blankets, a small bundle of dry clothes for each sailor, with a blanket in it; we took five days provisions with us, which were all cooked and wrapped up in waterproof cloaks.

After taking a barometric observation at the sea-side we commenced our journey direct for the lowest summits we had seen on the first range of hills. I went first, cutting a path through the woods with a matcheto; Forde, compass in hand, directing the route. It took us nearly two hours to reach the first hill-top which was determined by barometric observations to be 220 feet over the sea; after a short rest, an hour's hard walking brought us on the next hill-top, which is 276 feet high. These hills are very abrupt, and from the last one a good view was obtained into the country; towards St. Miguel, or S.W. from us, no high ground could be seen; and as we were evidently over the "Loma Desi-deada" (Hill of Desire), marked by Dr. Autenreith on his map, I began to hope we had got into the water-shed of the Pacific. As soon as this could be determined with certainty, it was our intention to return to this place and explore the summit range

for a few miles right and left, so as to find, if possible, some gorge which would give a lower elevation. At 10:20 A.M. we commenced descending the precipitous side of this range, our course being west, and in half an hour we came to a torrent running in that direction; we followed it for an hour, when it was joined by another stream from the N.N.W., and the two formed a considerable stream, whose direction was west. This gave us great hopes that we had found one of the tributaries of the Savannah River. We picked up some pebbles of soft sandstone and quartz, of the same character found on the Port Escoces side. Continuing to descend this brook, we came to two clearings planted with Indian corn, and a little further on one of the men saw three huts in another clearing, and heard two shots to the north. I think the noise proceeded from the breaking of branches of trees in the woods, but Forde and the men are positive they were shots.

At half past 12 we lunched off a tongue and some biscuits, and continued our course at 1 P.M. In half an hour we came to a larger river at a semicircular bend, coming from S.W. by west, the direction we wanted to follow; this puzzled us a good deal, but after a short consultation and examining the country from a bluff close by, we determined to follow the stream. At this point this river was

from 25 to 30 feet wide, rapid, and two feet deep, shewing that it must have a considerable catchment above; there was no flood in it, the water was beautifully clear, and gravel banks were exposed on each side.

Towards the south-west a plain extended as far as the eye could reach (at least six miles), but north-west were a range of mountains, apparently distant eight or ten miles, that terminated abruptly due west of us. After taking barometric observation, we continued our journey a little to the north of west sometimes fording the river, but more frequently cutting our way through thick underwood. I acted as pioneer all through, and at 4 P.M. called a halt for the night on the left bank of the river, where a bed of gravel was laid bare.

The river had been gradually increasing in size, and decreasing in rapidity; with a plain as far as the eye could reach to the south-west. At this point some rising ground was before us, and a valley running north-east. Down this we anticipated, came a tributary, and then we expected the two rivers would follow the low ground to the south-west.

With nothing on but a plaid each, Forde and I did justice to some boiled beef and biscuits, and a strong cup of tea. A bed of banana leaves covered with hammocks and blankets did not prevent the

presence of pebbles being discovered ; in a short time the mosquitoes began their attack, and a shower damped our blankets. Our minds were too busy speculating on where we were, and how we should proceed, to allow of those inconveniences being appreciated—the novelty of our position, the uncertainty of whether the watch-fire would attract or scare away an Indian, a tiger, or an alligator ; and our speculations on the various noises which we heard in the woods from time to time, made sleep out of the question.

We built castles in the air, and water communications from St. Miguel, as if such a saintly person can have got into that Hades where water is scarce. At one time I thought I heard the roll of surf on a sea-beach ; Forde said it was distant thunder ; I felt sure it was not, and puzzled myself to think where we could be. I had not much faith in Dr. Cullen's map, as his description of the land S.W. of Port Escoces was directly contrary to fact, yet it might be the Pacific tide running up the Savannah to within six or seven miles of where we then lay. I then fell into the land of dreams, and was again at an English fireside describing that day's excursion, imagination filling up facts for the succeeding days, and hope realising the complete success of the undertaking.

A heavy shower again dispelled these pleasant vagaries, and made me watch anxiously for daylight. At last, the whistling grasshopper began his morning call, and shortly after, a few green paroquets woke the feathered tribe, and the woods were again alive with sounds. A large baboon kept up a most hideous howl within a few yards of us ; it resembled the roar of a wild beast, and had I not been aware of his noisy propensity, I should have felt uncomfortable, notwithstanding that a six-barrelled revolver lay by my side.

At half past 5 the kettle was boiling, and we did justice to beef, biscuits and tea ; we resumed our wet clothes, strapped on our packs, and shortly after 6 were again *en route*, as we thought, to the Pacific. So satisfied was I that the river we were following ran to the south-west, after receiving the imaginary tributary from the north-east, that I started for a short cut in that direction, and left the river-bed. Every inch of road had to be cut through bananas, aloes, and prickly underwood, and the first half-hour did not advance us half a mile. I toiled incessantly with my matcheto until I saw rising ground, and at the foot of it a small stream running in a direction contrary to our course. This was a poser past explanation ; so we mounted the hill, which was very precipitous, though not high, and from its summit

saw our old friend, the river, quietly pursuing a northerly direction. I thought again of the rolling surf I had heard the night before, and my heart misgave me. Could we be near the Atlantic? was on my lips half a dozen times, but I did not like to dispel the pleasant illusions I had formed. We descended to the river down a precipice where hands and knees were of more use than feet, and followed its course in silence.

About 9 o'clock we saw an Indian woman and two children, one of them an albino. She led us to understand there was an Indian village close by, and shortly after we were overtaken by a canoe, containing three men, two guns, and several javelins; we shook hands, and gave them some cigars, and they motioned us to follow. The river had gradually turned to the eastward, so that there could be no doubt we were going in a direction contrary to our wishes. It could not, however, be helped, and we followed in silence. At 10 A.M. we came to an Indian village, situated in Calidonia Bay, on the Atlantic, about five miles to the north-west of Port Escoces. Our presence seemed to astonish the villagers considerably. After some parley one of them addressed us in broken English, and asked who we were, and what we had been doing. We answered, Englishmen, who had lost their way in the country.

The village was on the opposite side of the river from us, and some consultation took place before a canoe was sent to ferry us across. On landing we were received with apparent cordiality, the Indian who spoke English being evidently the head among them : he conducted us to the sea-side, a little distance from the village, and then commenced a scene which I can never forget. This Indian was called Bill, and he told us that the rest were very angry at our having been into the interior, as they allowed no one to land, the old man (their chief, who lives at San Blas) having ordered that no one should ever be allowed to land. We explained that we had arrived there in a brigantine, and no Indians coming on board, we took a trip into the interior ; that they never let us know this rule, and therefore we had not broken it wilfully. One young Indian, the eldest son of the old man, (as they call their chief,) and who will succeed his father in authority, got up and harangued the rest for nearly half an hour. I never saw a finer sample of excited passion. His frame was small, but beautifully proportioned ; he spoke with vehemence and much gesticulation, and Bill informed us, what we could see ourselves, that he was very angry. Several other Indians spoke, and then Bill smoothed them down by explaining that we had acted in ignorance, that we were Englishmen, and as such

ought to be their freinds, and advised that we should be allowed to go on board the Veloz, if we promised to set sail at once. This we readily agreed to, and after some more opposition from the chief's son, a canoe was launched, and Bill and another Indian came with us. The mountain barometer excited their suspicion, and I had to take it partly out, explaining it as a telescope; Bill knew better, but he said nothing. Half way to Port Escoces we met the gig of the Veloz, and another canoe, with four or five Indians in it. When we hailed Captain Maal, this canoe went alongside the gig, and two of the Indians entered it and commenced an angry discussion in Spanish about us: but to explain this I must go back to what occurred on board the Veloz during our absence.

We had not left it two hours when Bill and two other Indians came on board, and asked what the vessel was doing there. Captain Maal said he had met bad weather and injured his rigging, and he pointed to his fore top-mast, which he had purposely struck, and some torn sails which the sailors were mending; he also said he was short of water and provisions, and thought he could get both there. Bill informed him the old man allowed no vessel to anchor there; that he might go to Carreto or Calidonia, where there were Indian villages, and

they would trade with him, but it was no place to look for provisions, where there was only salt water and trees. The conference ended by Bill desiring him to sail at once. This was shewn to be impossible, there was no wind, and the rigging was dismantled, but Captain Maal promised to go in three days. The next morning (the 18th) an Indian called Denis came with several others, and scolded a great deal about the vessel anchoring away from their villages, and made a close inspection of all she contained, asking to see the injured rigging. This Indian lives in the Sassardi Islands, about ten miles to the north, and is their chief trader. He was among the Indians we met in the vessel's gig. Up to this time there was no suspicion that any one belonging to the Veloz was absent, and had we gone up the Calidonia river, instead of down, when we first saw it, I have no doubt we should have crossed the Isthmus without its being known, for in the interior there are very few Indians, and towards the Savannah river Mr. Kennish told me there were no villages; his informant was Mr. Hassock, who ought to know, as he has been seven years settled in St. Miguel. We all came on board the Veloz, and prepared to make sail, both Bill and Denis volunteering to pilot us out. Denis was particularly violent, and Bill, who stood our friend all through, advised

us to say as little as possible to him, "there are bad men everywhere," he said, "and Denis is one of them." We were examined and cross-examined as to our object, but we stuck to the one story, and I do not think they were certain of our intentions, although Denis on leaving said to Captain Maal in Spanish, "Do not let us catch you again bringing Americans here to look at the country and make a road across, the same as they have done at Chagres;" he was assured we were English and not Americans, but he shook his head.

During our absence Captain Maal and the crew passed a most anxious time, for although they felt satisfied nothing was known of our departure, they naturally were anxious about our return, when we should not only have run the risk of the Indians, but if he had been forced to sail we stood a good chance of starving. He had, however, laid his plans well, and it was arranged that the day he sailed the *Velo* would spring a leak, and in a great alarm he was to send for a number of Indians to assist in pumping. The vessel is well armed; there are twelve guns and several pistols on board, and twenty-four matchetoes, so that had things gone to extremities, we could have shewn fight. I do not believe the Indians are numerous, although with sufficient notice I dare say several hundred canoes

could be collected. At Calidonia there were not above a dozen, nor did we see more than 60 or 70 persons, including women and children.

I am satisfied Forde and I have been further into the interior of the country than any white man since the Buccaneers. Next to having crossed the Isthmus, I consider this discovery of a valley through the Loma Desídeada, with an elevation of only 40 feet, seven miles inland of the large plain extending south-west towards the Savannah, as the most important fact I could have elicited; and I am far more satisfied at having failed in crossing from Port Escoces, than to have crossed and returned (supposing that were possible with safety), and reported a summit of 275 feet, when within a few miles one of 40 feet is to be got farther inland.

It is dangerous to argue by induction before all the facts are ascertained. I have done so throughout this journal, and must be allowed to continue this false system until all the facts are got. In studying the geography of a country, some of the main features of which are known, but the details only a matter of speculation, every new fact tends to strengthen a preconceived view, or else to modify or overthrow it. Reasoning on such grounds is often dangerous by supplanting notions for facts, but most useful in careful hands, to prepare the mind to take advantage

of every fact elicited, and by induction to point out where a difficulty is most likely to be easiest surmounted. Such at least I consider to be the case here, where by tracing the river Calidonia for ten miles inland, the first difficulty, that of crossing the Loma Desideada, has been overcome, and it has been determined that from the western side of these hills there is level ground for at least six miles towards the Gulf of St. Miguel. The Calidonia river must have a considerable hydrographical basin above the point we first met it ; at least as great in extent as from that point to the mouth, because the quantity of water at the mouth was not double that of the place named. A continuous mountainous water-shed it cannot have, or the rising ground must have been seen, whereas hills were only visible on the eastern side ; also it is known that in mountain torrents the water rises and falls very suddenly, whereas the quantity being discharged by the Calidonia river increased very regularly as you descended. It may, I think, be therefore fairly inferred that on the south and south-west basin of this river the lands are low, or, in other words, that no mountain range forms at this place the division of waters running into the two oceans. Such a supposition agrees with my former argument based upon the directions of the Chuquanaque and Chepo rivers

intersecting at Port Escoccs, and the general range of the hydrographical basins between the Atrato and Chagres.

Forde and I are going to persevere in our inquiry, notwithstanding the encounter with the Calidonian Indians, and the Veloz will, I trust, land us in Navy Bay to-morrow, from whence we shall cross to Panama, and thence to the Gulf of St. Miguel. I have no doubt that the Calidonian Indians will be on the look out for us on the boundary of their lands, but I do not believe they extend to the water-shed of the Pacific, so that as long as we keep on rivers falling that way we are safe. I shall, however, if possible, go with a strong party and well armed, because conciliatory measures are now at an end. I have been warned what to expect if caught again on forbidden ground, and if it is necessary to do so, it will also be necessary to protect one's return.

From all the information obtained about the Indians on this coast, I had made up my mind that the only way to enter their country was by some bold step, carried out, if possible, without their knowledge, and under the guise of innocence of their rule. To ask leave and be refused, and then make the attempt, would be certain danger, and perhaps death; so when, after having been two nights and

one day at anchor, no Indians came near the vessel, I determined to steal a march on them and explore for myself—it was the least dangerous way to obtain the information I wanted ; because supposing even the commencement was made at the St. Miguel end, how could the “ Loma Desideada ” have been explored with safety with no head-quarters on the Pacific to retire to, and that is the most important point to surmount as far as can be known at present.

Taking that view of the case, the expedition we made from Port Escoces far from being a failure, must be considered as having advanced the discovery of a trans-atlantic route more than could have been hoped for in so short a time, and under the difficult circumstances it was undertaken. St. Miguel is under the dominion of the New Grenadians, and Mr. Hassock’s partner the alcalde, so that it can fairly be expected that the examination of the Savannah will be made under good protection, and a passage forced if necessary to the confines of the Indian property. I will trust more to rapidity of movement than to numbers or arms ; however watchful the Calidonian Indians may be, they cannot probably collect in a few hours a force sufficient to stop six or eight well armed and determined persons, besides, I am pretty confident they have no canoes on the rivers falling into the Pacific, nor do they claim any jurisdiction over them.

Bill, in conversing, told me that the farthest Calidonian Indian settlement was a day and a half from the village, and as the interior is used for growing bananas and Indian corn, these settlements must be along the borders of rivers where they can get access to them by canoes. A few straggling Indians do probably hunt in more inaccessible places, but they are not likely to come near a party of six or eight persons with hostile intentions. If these Indians have no suspicion of our object in exploring about Port Escoces, I should say all the dangerous part of the expedition was over; but I fear they have, more particularly Bill, who although befriending us, warned us most emphatically not to attempt such a thing again. He had been in England for a few months, and Denis had been to Baltimore. They are both traders, exchanging cocoa-nuts, tortoise-shell, bananas, &c., for clothes, firearms, hatchets, and trinkets. The "old man" does not allow them to take a present; tobacco, brandy, or anything of immediate consumption they will accept. I persuaded Bill to put into his pocket a bunch of glass beads for a necklace for his wife, but he returned it before leaving, saying he was afraid of its being found on him, and then the old man would blame him. They all seem to obey this chief implicitly; he lives at the Rio Diablo, near St. Blas Bay, and is the same

who came on board the American steamer at the time a staff of engineers from Chagres went to try and explore the country. They describe him as very old, with snow-white locks, and a mild and dignified manner; he is allowed two wives, bigamy being generally prohibited among them.

An offence against chastity is punished by death; they marry young, the men from eighteen to twenty, the women at fourteen or fifteen, and as they are bound never to cross the breed with foreigners, inter-marriage is very constant, and the race is degenerating.

Generally they have large, flat heads, with eyes greatly slit and far apart, but very brilliant, high cheek-bones, a short neck set into high and broad shoulders, but thin through the chest. Their limbs are beautifully shaped, small, but all muscle, with perfectly formed hands and feet. Both sexes wear their hair long; it is always black and very straight, and generally neatly combed out. We saw one woman with gold rings through her ears and nose, but otherwise, the only ornaments I observed were strings of beads round the neck. They were all clothed, chiefly in English cottons, but they have a native stuff of a bluish colour, which they manufacture out of the fibre of some tree.

In the interior, Denis told me the Indians go nearly naked, and are much less civilized than those

on the coast; I could not find out what proportion live in the interior, but I suspect it is small, and that the whole population does not exceed a few thousands. The chief settlement is about San Blas, the rest of the coast being dotted over with small villages, so that in any treaty with these independent Indians, it would be easier to obtain a portion of their territory about Calidonia Bay, than nearer to the head-quarters of their tribe.

I feel more satisfied than ever that it is only just that this nation (for a nation they are as much as England or New Grenada) should be treated as a free and independent state, and if any portion of their territory is necessary for the facilities of commerce, the position they now hold should be secured, and a treaty of neutrality entered into. On such terms, I have no doubt, these Indians will willingly cede a tract of land to England on reasonable terms; and having once made the agreement, I am satisfied they will hold to it. An acknowledgment of their independence by a power like Great Britain will do more to civilize them by contact, than a thousand futile claims of possession like that put forward by New Grenada, can do by compulsion or oppression. They have too fearful an example both in North and South America, of the total destruction of their race where the white man has supplanted them, and

nearer home, Spanish tyranny has left wounds of which the cicatrice will never heal. Heretofore, Indian tribes have been treated like wild beasts—their rights to property have never been acknowledged, the wrongs they have suffered never redressed: let a contrary system be adopted, and I have no doubt the exclusive spirit which now animates them, will gradually wear away; commerce will foster education, and the change from a savage to a civilized life will take place without the cruel and oppressive tyranny which annihilates one race to make a stepping-stone for another, and of which the history of Central America is so true a type. The commerce of the world demands a transatlantic water-communication: why not put the question at once upon a proper footing, and have a careful examination made of the whole Isthmus? instead of seeking scraps of information by stealth at the risk of the lives of the explorers. To make such an examination requires a proper understanding to be come to with the possessors of the soil; such an understanding as will secure to them the privileges they have maintained for centuries, and at the same time prevent them being a stop-gap to progress and the requirements of more civilized nations.

America is certainly the most go a-head nation in the world; but there is something superlatively

selfish in her progress: the first person is always uppermost in their mind, and *meum* and *tuum* is not judged with even-handed partiality when it relates to the property of aborigines. The Indians naturally fear that if the Yankees make a communication across their country they will not stick to the road, but when gain is to be got on each side they will strive for it, and gradually annex the whole country. England, on the contrary, has never, in this continent at least, wrested land from the natives without some show of giving a *quid pro quo*, and her countenance and protection will not only be acceptable but eagerly sought for when other nations are striving for possession.

I have been rather disappointed in the growth of the timber I have seen. Logwood, ebony, and mahogany are only occasionally met with of good scantling and straight in the stem. The wood scenery is not so imposing from the size of individual trees (although now and then they offer a remarkable object in the view), but from the grouping of stems with underwood, the variegated foliage, and still more particularly the creepers that festoon from branch to branch, sometimes as parasites, at others springing from the ground they reach the highest branch, and then growing down take root again, or swing in graceful forms from tree to tree. Beasts

and birds are scarcer than would be expected from the undisturbed possession they have. A few monkeys, lizards, small alligators, and toads are now and then seen, and parrots fly about in flocks, screaming their discordant notes. I saw a few of the duck tribe, and some kingfishers, but no humming birds, nor much of that bright plumage which is always associated with a tropical climate; hawks and vultures are very plenty, and of large size. I dare say they keep down the smaller birds that are not gregarious like parroquets. We did not meet a single snake, and Bill told me that there were not many, and only a few of them are deadly in their bite, although they are all more or less venomous.

The Indians have a cure for a snake bite; it is the leaf of a tree, and said to be certain in its salutary effect. There is a pretty story about the way it was discovered. An Indian saw a snake in a tree robbing a nest; the mother attacked the reptile with great perseverance, but every time she was bitten flew to a neighbouring tree and eat one of the leaves; then the attack was renewed. At last the little thing was so exhausted the Indian caught her, and took her home, with some of the leaves of the tree he had observed her fly to, and although there were several bites visible, the bird continued to eat of the leaf and recovered.

I have not yet succeeded in obtaining any specimen of this herb, but shall do so, that its anti-venomous properties may be inquired into. There is also the bean or pip of a fruit which is said to be very efficacious in cases of snake bites; it is not, however, so certain in its effect, nor so generally in use.

June 22nd.—At 4 this afternoon we anchored in Navy Bay. Travelling and preparing for going to the Gulf of St. Miguel have prevented me noting down our proceedings. Navy Bay is little better than an open roadstead, surrounded on three sides by a swamp. The town shews evidence of its recent origin, and of the enterprise that originated it; it is situated on an island, and the railway reaches it on a timber jetty. We arranged to leave for Panama by the morning train of the 23rd inst. taking with us as few things as possible, as 23 miles of the road has to be crossed on mules.

We left about 10 A.M. (23rd June) and went 21 miles in two hours. I had heard a good deal of the difficulties this railway company had to encounter in crossing the first few miles of swamp, and the accounts are not at all exaggerated. I am surprised the work was ever completed, even at the sacrifice of life which is known to have occurred.

The first ten or twelve miles of the line is supported on timber-piles, driven into swampy land of far worse

description than I ever saw even in Ireland ; and when this swamp is placed in a tropical climate, parched with sun for seven months and deluged with rain for the rest of the year, without the means or appliances of a civilized country, the execution of the railway, even in its present imperfect state, is one of the most difficult engineering operations that I have ever seen or read of. It must be owned, however, that its construction is anything but permanent, and both time and money will be required to reduce "maintenance" to a reasonable item in the yearly accounts submitted to the shareholders. Its traffic is a monopoly, commanding almost any prices (we paid 32s each for 21 miles), and as long as such is the case dividends must be high, and the speculation remunerative. The chief difficulty is got over, although only in a temporary way, and it may be fairly expected that the remainder will be completed in two years, or perhaps sooner, in a manner more likely to be permanent.

The Company claim a monopoly of the whole Isthmus of Panama, as constituted on the 1st January, 1849, when it included the provinces of Panama and Veragua, but not that of "Darien del Norte," which at that time was a separate province, and was only amalgamated with Panama in June, 1850 ; yet in the concession granted by the Grenadian Govern-

ment, for the construction of the Darien Ship Canal, a clause has been inserted giving the Panama Railway Company the power of preventing the privilege being used. I do not think it right or just for any government to prejudge a case ; and, admitting that there is a doubt in the matter as to whether Darien was part of Panama at the time the concession of 1849 was given, the question should have been allowed to be tried between the parties interested, and not, as it has been, decided by a Legislative Body, without a proper investigation into the merits of the case. The two interests are really very different, and cannot be regarded as in opposition to each other. The railway originated with the requirements of the trade to California, and is supported by it. A ship canal must look much further and to other interests for support and utility. The heavy goods which now go by Cape Horn to California will certainly pass through such a communication, but for passengers and light goods the railway will always be the quicker and cheaper mode of transit. St. Miguel Bay is 90 miles south of Panama, and Port Escoces 120 miles from Navy Bay, so that the voyage through Darien Canal would be over 200 miles of a round in going to California.

During our journey on the railway, we observed sitting opposite to us a fair-haired person with most

lady-like limbs and features, but dressed as a man. After a careful scrutiny of the dress, I observed the hair was put up with hair-pins, but in such a way as to appear like man's long hair—the hand, the foot, the smooth chin, all tended to convince me that some fair lady was travelling incog.; and I was surprised there was no gentleman with her, for there she sat alone, and, apparently, without an acquaintance, but still conscious that suspicion as to her sex had been roused. On arriving at Tabanilla, where we had to take boat to Cruces, ten miles further, an American gentleman, whom I had not observed before, offered to join us in hiring a boat; and he added, I have my wife with me, who, for the convenience of travelling, has put on men's clothes. The mystery was solved, and in half an hour we were all sitting in a large canoe which was to take us to Cruces for 35 dollars. Just at starting a squabble took place between the owner of the boat and the crew as to what wages they were to get, and it ended in two of them leaving, nor could any other negroes be induced to take their place. Three American sailors, who had deserted from the "Philadelphia," a large steamer running from New Orleans to Navy Bay, volunteered to pole us up if we gave them a free passage. This was agreed to; but when the negroes found we could go independently of

them their vanity was hurt, and they returned to the boat; we gave the sailors a passage as we had promised, and found them very useful on the road; they were, of course, bound for California.

The river Chagres was considerably flooded; the current from three to five miles an hour, made our progress slow, and it soon became evident we could not get beyond Gorgona that night. At first the scenery was flat, and the timber along the banks bounded the view to the windings of the river; gradually however, detached hills became converted into a range; here and there wood was entirely wanting; the sloping sides, being covered with rich verdure, opened vistas, which reminded me of English parks; but parks where the greenhouse had been turned out of doors, and by some magic power the ferns and creepers had become arborescent. These patches of natural pasture are spread irregularly in hill and valley, and without any apparent topographical reason; but I remarked, that they all occur on a light sandy soil, different from the red earth which characterises the country. In a few places, both on the railway and along the river, a rotten stratified sandstone appeared, and in one place a quarry of light grey sound freestone is worked for railway purposes.

At 9 o'clock, P.M. we had only gone six miles, and a halt was made at the village of the One-house (so

it is called, and so it is), where refreshments were to be bought ; we were provided beforehand with biscuits and sardines, but I determined to see what such a place could afford, and to my surprise found brandy, rum, wine, coffee, chocolate, biscuits, and Bass's pale ale. I could not resist my pale friend, and paid half a dollar for a pint. The label was Bass, but the interior was vinegar, or nearly a kin to it. The beer was spurious, for at Cruces, the next day, I got a bottle of real Bass, and enjoyed it exceedingly.

It was past midnight when we arrived at Gorgona, where an American keeps an hotel, fitted up for Californian emigration. Mr. Edmonds and his wife got a private sleeping room, but Forde and I were located among 100 stretchers, fortunately all unoccupied but two or three, and there was another room in the house with as many more ; we had arranged that the sailors were to watch turn about, for there was a fandango or negro ball in the village, in celebration of the eve of St. John's day, and the crew would be certain to leave our baggage for the pleasures of the mazy dance.

I had been in bed a little over an hour, when the landlord called me, saying that our boat was gone ; one of the sailors had been on shore, and on his return found such to be the case. Two hours search

by moonlight, on muddy banks, and inquiries among the other boatmen, failed to elicit any news of our lost property, and I returned to bed until daylight, convinced that our Californian adventurers had dropped down the stream to rifle the baggage. At daybreak it was agreed that I should proceed down the river in a small canoe, and institute a search. I started with two negroes, a little provisions, and a six barrelled revolver, with my temper sufficiently on edge to have used the latter without much provocation ; after two miles of paddling we spied the boat moored to the shore, but no one in her ; the baggage was untouched. In a few minutes the two American sailors appeared, and seemed as glad to see me as I was to find the boat. They said that the third man, who was ashore, had been left on watch, and that during their sleep some one must have let the boat adrift, for they found themselves, about two in the morning, three miles down the river. I suspect our own boatmen had a hand in the trick, for they appeared quite unconcerned about the matter ; they probably felt annoyed at our entrusting the charge to white men, for when I blew up the captain, as he called himself, he said, " You no trust nigger to watch, you trust white man, so you lose boat." After breakfast another difficulty occurred ; one of the negroes was dead drunk, and the

other, having earned a couple of dollars, was independent for the time, and refused to proceed any further. Coaxing and threatening were resorted to : dollars alone could move these scions of slavery ; and at ten o'clock we had a fresh crew, and got under weigh.

Cruces is six miles from Gorgona ; it is the highest point to which the Chagres river is navigable, and that only during the rainy season. The character of the scenery is much the same as near Gorgona, becoming gradually more hilly, and consequently more extended in view. The foliage was in places very picturesque on the sloping ground ; the gradations from brushwood to the lofty cuipa tree is unbroken by stems ; only one mass of gracefully undulating forms, with every variety of colour and shadow that vegetation is capable of assuming. There are only two elements in the scenery of almost all the interior, undulating ground covered with trees, yet these two elements give a variety of views which nature alone can portray. The most accurate copyist, with the greatest command of pencil, cannot put on canvas the constantly changing forms of light and shade, on which the whole picture depends.

We arrived at Cruces early in the afternoon on St. John's day, the 24th of June, and found every one in holiday attire, revelling in those vices which

an abundance of money in uneducated hands is sure to create. There was a panic about cholera ; three had died of it the day before, and several were supposed to be then under its influence. I never saw a craven spirit more exemplified than among these uncouth Negroes, Spaniards, and Americans, who have sacrificed body and soul to dollars, who look upon death and eternity as a mere fable until some sudden visitation brings it forcibly under view. Dollars in this case could not save ; their divinity was overruled by a stronger power, whose existence was scarcely acknowledged, and all who could manage to do so, were leaving the place panic stricken. We determined to push on, if possible, and after a deal of trouble and paying double prices for mules, we got away about four in the afternoon, without leaving the baggage behind.

I had heard a great deal of the badness of the road, but had no idea how nearly impassable it is during the rainy season ; nothing but a mule could possibly travel along it, even at the foot's pace one is obliged to go. We persevered until 7 o'clock, and had then only got six miles from Cruces : but it was quite dark, and we were obliged to halt at a "stopping place ;" so it is called, and no more appropriate name could be given, for, although it boasted of "entertainment for man and beast," like many an Irish hostelry, as

all the means of entertainment had to be conveyed along the same road we had come, the quantity, quality, and price were proportionate to the difficulty of carriage. The house consisted of bamboo-walls supporting a palm-leaf roof, under which was a loft also of bamboos, placed far enough apart to allow your foot to slip through; there were, fortunately, three cots at a dollar a night, and a cow's hide under each to keep them steady on the gridiron floor.

It afforded us considerable amusement to make arrangements for going to bed, viz.: lying down in one's clothes as we were, a lady and three gentlemen to fit into three cots placed near each other in the strongest part of the loft. Jokes and anecdotes made the bamboos tremble with our cachinations, and it was late in the morning when Mrs. Edmonds pulled Forde's hair to wake him, vocal admonitions being drowned by his performance on the nasal organ. Our first inquiry was for the muleteer; we found he had gone to look after two mules that had strayed away; there was no help for it, and we waited patiently until near eight; we started without them, taking one spare mule that we found at the stopping place.

The road continued to be almost impassable until within six miles of Panama, where a more level country and a gravelly soil gave it a better chance

of maintaining itself in repair. I am surprised that with brother Jonathan's eagerness for speculation, no company was formed to keep this road in repair at the commencement of the Californian mania, and levy a toll on it; nothing could have been more remunerative, as the materials for forming a road are close at hand, and the expense for the twenty-five miles could not have exceeded four thousand pounds; the receipts, at even a dollar a mule, would have repaid the capital the first year.

Within a mile of the town of Panama, Mrs. Edmonds retired into a dilapidated old building, the remains of Spanish luxury, and resumed her feminine attire. A good habit skirt was made out of my Scotch plaid, and we trotted up to the Louisiana hotel about 4 in the afternoon, not at all sorry to leave the uncomfortable Spanish saddles we had sat in for eight hours.

To describe Panama as it was before California transformed it into a commercial city, would be a repetition of Cartagena or any other Spanish American fortified town; large houses with overhanging balconies and heavy tiled roofs, range monotonously along narrow paved streets, the whole surrounded by massive fortifications of the 16th century. At Cartagena this antiquated architecture reminds one of past days and old age, with nothing but a gradual

decay in prospect; at Panama, on the contrary, there is a quaint mixture of modernized antiquity. The moat is filled in and the drawbridges removed; the gloomy shadow of projecting balconies is enlivened by the display of silks and cottons, hardware and provisions; what was the hall of reception, is now the store of the merchant; in every direction hang large boards painted with the names of competing traders. French pastry cooks, English cutlers, German jewellers, and American stores (which comprise a *multum in parvo*), supply every article of necessity and luxury, at prices about 100 per cent over the home cost. Apothecaries and tavern-keepers are the most numerous class; their trade is of mutual benefit, for nothing is so deleterious as the use of spirituous liquors, and yet nowhere do you hear more extensive orders for sherry-cobblers, sangaree, gin cock-tail, &c.: the heat incites thirst, and the satisfying of the latter produces fever and dysentery, the only two ailments which are fatal to whites.

The whole of the coast of Panama on both oceans has always borne the character of being one of the most unhealthy places in the world; and yet, except in wampy situations like Chagres and Navy Bay, I do not think such is at all the case. There is no doubt, that a hot sun and heavy night dews require to be guarded against; and it must not be expected that Europeans

can pursue their avocations in exactly the same manner as they would at home. It is said of a lady, whose husband was once well known in certain circles in England, that in excusing her son's extravagance on his foreign tour, she said, "You know when one is in Turkey, you must do as the Turkeys do." To no place is the mis-quoted adage more applicable than to this Isthmus, and nowhere is it broken more indiscriminately by those who pass through the country.

Among residents the mortality at Panama or at Cartagena is not above the average of many parts of Europe; robust health and a vigorous frame are certainly much rarer, but this must be expected, when the bracing air and more active life of northern countries is wanting.

Washing is so dear at Panama, from the cost of labour, and the distance water has to be brought, that the lower classes often wear out their shirts and stockings, or throw them away when too much soiled, as it is cheaper to buy new ones than wash the old. We had to pay four dollars a dozen (16s 8d) for washing; rather extravagant when socks and pocket handkerchiefs are included in the count. A good tradesman can earn five dollars a day, and a labourer a dollar and a half; sailors get from 30 to 40 dollars a month and their keep. The cost of living is not

more than 50 per cent over English prices, so that with care and economy small fortunes are rapidly made, which, when put into trade, often raise a humble mechanic to the position of a rich merchant. Such is the real history of fortunes, and not, as is generally supposed, a lucky gold digging, which in a few months has realized thousands. Some have made large sums at the diggings, and thousands are now earning a livelihood at them ; but I feel satisfied that prudence and foresight in commercial speculations, at a time when the demand commanded high prices, has raised more people to affluence than the gold discoveries, which set the whole system in motion.

There is at present a French company that have received certain concessions in Darien on the "Rio Grande," whose object is to open the gold mines at Cannes, which the Spaniards worked successfully until they were driven out of them by the natives and freebooters. There is no doubt these mines are very rich, probably more so than any found in California, and yet they must remain a dead letter until some turn of events shall induce emigration on a sufficient scale to carry with it the facilities and requirements of a trading community. The want of labour is the real difficulty to be contended with, and will always be the stumbling-block of all gold-mining companies in un-

inhabited regions. Gold washing requires but little skill and less machinery, and is much more adapted to individual exertion or the combined efforts of a community of workmen, than to a body of men who are not themselves executives, but depend upon others to raise an article so easily secreted, and so certain in its market value. Native labour, by which I mean Negro or Indian inhabitants, can never be depended on, they scratch the ground and throw in a few seeds, build a bamboo hut, and are as independent as the gallant member for Lincoln; beyond a bare existence, they merge into depravity; money is only of use to them to satisfy vices, and as indolence and perfect command of their own time and actions are the leading features of their character, no agreement, no prospect of permanent improvement binds them to constant or regular work. Such is the reaction of slavery, and such it will continue to be, until a few generations have wiped out the stigma attached to the name of Negro. The American sailors who followed us to Panama, when asked why they deserted the Philadelphia steamer, said, "The captain treated us like Niggers, and no white man could stand that." Volumes could not shew more emphatically the degrading condition in which blacks are still held in the United States.

Yankees are certainly very clever at dollar hunting,

but they do not accompany the search with the comforts, or even the necessities which civilization requires among other nations. The Panama hotels boast of very extended accommodation, as far as numbers of beds and at the table d'hôte, but cleanliness or privacy are not at all consulted ; sleeping and eating are looked upon as unpleasant necessities, which nature has enforced to refresh men, to enable them to resume with vigour their search after dollars, so they are got over as rapidly and unceremoniously as possible.

This morning (26th June) we called upon Mr. Perry, the English Consul, and before evening we had hired a small schooner, 12 tons burthen, to convey us to St. Miguel. We were anxious to leave Panama as soon as possible, because many Indians come in their canoes to trade in fowl, maize, and fruits, and I was afraid that our Calidonian friends might learn our movements and give us an unwelcome meeting in the interior. The owner of the schooner, Dr. Le Breton, is agent to the Gold Mining Company who have a concession of the Cannes mines, and had often been to St. Miguel and up the Darien river to Chapigana and Yavisa ; he gave us a great deal of interesting information about the country.

On the 27th of June we had all our stores and

provisions on board, and set sail about three in the afternoon with a favourable breeze. I had hired two of the American sailors who had crossed the Isthmus with us, so that our crew consisted of the skipper (a Frenchman), two sailors, and a cook. We were off the Pearl Islands the next morning, and anchored that evening at Punto Brava in the mouth of the Gulf of St. Miguel; here we had to wait for the tide, the breeze being light and the current strong.

An accurate survey of the mouth of this bay was made in 1849 by Captain Kellett; and, although the chart was not published when I left England, Sir Francis Beaufort, the admiralty hydrographer, was good enough to allow me to take a tracing of the original map. It is much to be regretted that Captain Kellett did not survey the whole harbour, as the map we have made, though correct in the general features, is not sufficiently detailed for navigators. The land on each side is not high, and it is only in the distance that the Cordilleras are seen, raising their summits into the clouds. At Garachina point the character of the country is much more mountainous, and the dome-like summit of the mountain itself is seldom free from clouds. The Indian village of that name is situated at its foot; it is one of the largest settlements along the coast,

and a number of canoes trade from it to Panama. The remainder of the shores of St. Miguel are uninhabited until you reach Bocca Chica, one of the entrances to the inner harbour of Darien. A row of islands in a line with a promontory divides the bay of St. Miguel into two. There is deep water almost everywhere with good anchorage, the islands forming a natural protection, so that a fleet of a thousand sail could lie with safety inside them ; but if this inner bay of St. Miguel offers advantages as a harbour, the still-water inside Bocca Chica does so a hundred-fold. It can only be compared to an inland sea, land-locked on every side, and surrounded by low hills from which at all times blows a gentle breeze. This harbour which I call "Darien," to distinguish it from the outer and inner bays of St. Miguel, is about nine miles long and from three to five miles broad. The depth varies from eight to twelve fathoms at low water, with a sandy or clay bottom. There is one rocky shoal a little south of the Savannah mouth, it is only bare at low-water spring-tides, but there is deep water close by, and a good sailing channel on each side. I had not time to examine the Bocca Grande, but I understand it is interrupted by rocks and shoals. The Bocca Chica, though narrow (about 250 yards across), and with a strong tidal current, answers the purposes of an entrance so

admirably, that it is quite immaterial if the Bocca Grande should be impassable. There are a few huts at Bocca Chica, and on the west coast of Darien Harbour, but the principal settlements are on the Rio Grande (or Darien), sometimes miscalled Tuyra on English maps. Chapigana, Molinica, and Yavisa are native villages of considerable size, and the head-quarters of the local authorities. It must not be supposed, however, that these are settlements of pure Indians; the native population now consists of an admixture of Negro and Indian blood; this is the case everywhere on the Isthmus, and in Central America, except where the San Blas and Mandingo tribes (the true Indians) have maintained their independence and the purity of their origin by closing their country against all inroads from strangers. This mixed population, the remains of Spanish slavery, acknowledges the government of New Granada, and is subject to its laws. A letter to the "alcalde," or chief judge and local governor, will secure every one both assistance and safety in exploring the country as far as their jurisdiction extends; the Negro Indians have no claim or title to any land beyond what their own industry has reclaimed.

On the Savannah river there is no population. Mr. Hassock has built some ranchoes (bamboo sheds), for the use of the axemen he sometimes

sends up the river to cut down timber, but otherwise no canoe ruffles the water, and birds, monkeys, and wild beasts are in undisturbed possession of the woods.

At Bocca Chica we hired a canoe, and at noon on the 30th June, a light breeze and flood tide brought us into the Savannah river. The mouth is about two miles wide, with nine fathoms of water at low tide. The left bank (looking up stream) is elevated from 100 to 300 feet, but on the right side a mangrove wood is flooded every tide for nearly a mile inland. The soundings for the first five miles (reduced to low water) varied from six to nine fathoms, with soft blue mud, the river narrowing to less than a mile. This tide took us about nine miles up the Savannah; we anchored at 4 P.M. when it began to ebb, and about 8 o'clock we were left high and dry on a gravel bank. The tide here rises about 20 feet, but as the moon was full it is probable that ordinary tides do not range more than 17 or 18 feet. Shortly before midnight we were again afloat, and with the assistance of sweeps, there being no wind, we reached the junction of the river Lara at two A.M. (July 1), and at half-past three we anchored near an island about four miles higher up.

About seven miles from the mouth the river is studded with islands, some of which on the right bank

are very picturesque; the hills on one side coming close to the water, and as seen by moonlight, with their undulating summits sharply defined against the deep blue sky, formed a picture which can only be truly appreciated in the Tropics, where lights and shades are so much more clearly contrasted and broken into fantastic shapes by the leafy canopy which everywhere covers the ground. Nearer to the junction of the river Lara and above it, the country assumes the character of a savannah, or flat plain. Mangrove trees twine and twist their numerous upstanding roots in the soft mud deposit, flooded at every tide, and the lack of underwood and of those innumerable creepers which generally hide the stems of the trees, renders the scenery bare and devoid of interest. At times the silence and solitude of the night would be broken by the howlings of black monkeys, who associate in small colonies, and howl in concert whenever anything disturbs them. Innumerable fire-flies constantly flit among the foliage, and now and then a bittern or egret would fly close to the vessel, shewing by their unconsciousness of danger the peaceful possession they enjoy.

This moonlight trip was much enjoyed by both of us. There was excitement and novelty to add to the charm of exploring almost unknown regions. Tracing each reach of the river, and fixing its bearings,

taking soundings, and sometimes striking on a gravel bank, made hours steal by unconsciously, so that when we did come to anchor it was almost with regret that we lay down in our berths to wait for the morning flood tide.

The land on each side of this place is low and covered at high water; the tide rises about eight feet on the right bank, and inside the small island, under which we lay, I saw the first specimen of rock *in situ*. It consists of a stratified shale, dipping north-east by east at an angle of 45° , but irregular, and considerably disturbed towards the south; so much so, that in one place the beds appeared to dip at right angles to each other, forming a synclinal axis. The top of this rock is cut off to a perfect level, and covered with three or four feet of mud, over which grows an impassable mangrove wood. The gravel shoals contain pebbles of igneous rock, mostly red porphyry, with a few specimens of quartz and volcanic tuff; the chief part, however, consists of shale, which retains its flat beds, but is rounded at the edges by the action of the water and rolling along the bottom. The tidal deposit of mud is alive with land crabs, some of a bright red colour, having but one claw, which they carry on their back, but more generally resembling the English sea crab, though much more nimble in their movements. At

Cartagena I often watched the awkward though active movements of these creatures; they dig a hole in the sand a little above high water mark, and when disturbed scamper along the sea beach at a wonderful pace. Those that live among the rocks not only climb with ease, but run along the tops of the stones, and jump from one to another a distance of three or four feet. The natives catch the larger ones and eat them; I believe they are watery, but very palatable when properly seasoned.

At noon the tide turned, and having put into the canoe provisions for three days, with our hammocks and blankets, we commenced to ascend the river. The course was very tortuous, and as tidal action decreased the land on each side got above its influence, and the character of the river more rocky and with a narrower bed. About two miles above where the Etincelle lay, we came to the first fall of two feet. It is caused by the crossing of a ridge of rock almost similar to that previously observed, but harder, more decided in its stratification, and less inclined; there is six feet of water just above and below the fall, with rock bottom. It appears as if some of the beds of this formation are harder or less worn by the water than others, and these become sharply defined both in their strike and dip, and cause the falls, which above this place

are more numerous as we ascend. The general character of the river for six or seven miles above the first fall, is a succession of level reaches, having from four to six feet of water, terminating in a rapid of one or two falls, varying from six inches to three feet. The land on each side is above the influence of flood, but level, except where a bluff of from 50 to 100 feet, with steep sides and a rounded top, abuts close against the banks on each side, presenting the appearance of having been cut through by the action of the water. These bluffs, which are not frequent, rest on the stratified rock which forms the characteristic geological formation of the valley, the beds of which become thinner, and the stone softer and more crumbling as you ascend, until in one place particularly, where we stopped for the night, I was reminded of the trembling hill at Castletown, in the Peak of Derbyshire. With the exception of the river Lara there are no tributaries of any importance join the Savannah, and the river itself above tidal influence discharges but little water during the dry season, and swells out into a considerable stream during the rainy months; we had a good opportunity of judging of this change; as we ascended, the water was low and pretty clear, shewing evidently that no freshet had come down for several days.

About 6 o'clock in the afternoon, just as we had finished our meal, and were preparing to swing the hammocks, a thunder storm, accompanied with a down-pour of rain, such as can only fall in the tropics, wet everything in half an hour; our matchetoes, bought in Panama, had not been sharpened, so we could not clear a place to swing the hammocks; we had, therefore, to content ourselves to lie on the ground, covered with blankets and Scotch plaids; as the moon was full, the fire was allowed to go out, and we lay drenched to the skin watching the lightning, and listening to the peals of thunder which appeared to break right over our heads. This deluge continued until past midnight, when the fury of the storm somewhat abated, and occasional heavy showers at last gave way to a bright moon and a clear sky. The river was rising rapidly, so we collected our few canteen utensils on a high spot, as we thought, above the influence of any flood, and having baled out the canoe, lay down in her two and two, Forde and I in the bow, and the two American sailors in the stern; notwithstanding the wet, and our cramped position, we got a few hours' sleep, and at daylight found the water had risen over eight feet, and swept away the kettle and a few other small things. There was no help for it, everything was too wet to make a fire,

so after taking off our flannel clothes and wringing them, we put them on again, and sat down to a few biscuits and weak brandy and water.

At six o'clock we tried to ascend the river, but the current was too strong, and after ineffectual attempts for more than an hour, we determined to make that our starting point, to examine the interior towards the Calidonia river. One sailor was left in the boat with orders to remain there until the next day at 4 P.M., when the provisions would be out; he was then to return to the Etincelle for more, and wait until we joined him; the other sailor came with us. Forde had a mountain barometer, and two pocket compasses; I was armed with a matcheto to clear the way. As I stated before, the matchetoes had not been ground, so that had not the wood been fortunately tolerably open, our progress would have been very slow, and my sinews severely taxed; as it was, we managed to make $1\frac{1}{2}$ miles an hour. The land was level for the first two hours, and then a gradual ascent brought us to a summit which, by barometric observations, was fixed at 130 feet above the mean level of the Pacific. Several small streams were crossed in this ascent, all flowing in a southerly or south-easterly direction, and evidently tributaries of the Savannah. After crossing this summit, and about five miles from where we had left the canoc,

a small stream flowed nearly due east ; following its course for more than a mile, we came to a considerable body of water flowing east, and gradually bending to the north-east. We followed this river along the banks (for it was too much flooded to walk in its bed) for two miles, until it assumed a decidedly north-easterly direction ; the valley, as far as we could see (two miles at least beyond the place we stopped at), continued the same course, and the direction of the rising ground satisfied us that this river must flow into the Atlantic. It is not much smaller than the Savannah, and about the size I should have expected to find the Calidonia six or seven miles above the place we first saw it in the Port Escoces exploration. In one place it was evident that human labour had thrown the trunk of a tree across this river ; the branches were lopped off, and the ends roughly squared, and laid on a firm part of the bank, with two or three feet of bearing on each side ; a decided pathway could also be traced leading to and from this foot bridge.

I was aware that the Calidonian Indians had their hunting grounds between the river of that name and the Savannah, and I also learned from themselves that they claimed no jurisdiction over the country the Savannah flows through, which is, in fact, perfectly uninhabited. I had no doubt, there-

fore, I was in the enemy's country, and neither of us had any wish to fall into their hands a second time after the warning we had had at our first interview; besides, they were aware of our intention to go to the Savannah, and I feared scouts might have been sent to the boundary of their territory to watch for us. We therefore took barometric observations, collected a few geological specimens, and returned on our path. During the morning continued heavy showers had wet the compasses, so that neither would traverse freely; another heavy fall of rain during the time we were discussing some biscuits and a pot of preserved meat, drenched the graduated cards of the compasses, so that the needles stuck to them, rendering it almost impossible to fix any course. The matchetoes were so blunt and the woods comparatively open, so that it was next to impossible to find the exact path we had come by. Here and there marks had been left on cuipa trees, but the trees were numerous and the marks few, so that the chance of finding the latter was small. We pushed on as rapidly as possible; the state of the compasses rendered our course uncertain, and nowhere could we find traces of the morning path. On arriving at the summit, barometric observations were taken, which agreed with those observed before, allowing for the horary variation which we had determined with great

accuracy by a number of observations at Cartagena, and had found to be nearly the same at Panama.

At four o'clock we found a considerable river flowing under a bluff which we ascended, and doubted if it could be the Savannah; first, because we had not expected to reach it so soon, and secondly, because we could not recognize any of its features. As it turned out afterwards it was the Savannah, between the first and second falls; we had seen it low, with half the rocky bed exposed; it was now in a high flood, with the turbid waters within a few feet of the banks. In a country closely wooded and offering but few salient features, looking from the river towards the banks is very different from looking down from the banks on to the river, particularly when there is such a change in the volume of water. At first we ascended for some time, and shouted and fired off a pistol, hoping the man in charge of the canoe might hear us and fire a return shot, for we had left arms with him. When this failed, we thought it best to descend, for if it was the Savannah the tidal effect could soon be reached, and under any circumstances the Etincelle must be lower down. The compasses were so completely useless, that the river-bank had to be followed of necessity for fear of losing our way, and there the underwood was very thick;

prickly palms grew so close together that in half an hour my trowsers were in shreds, those behind me (for I still wielded the blunt matcheto) fared a little better, although Forde's garments were much thinner than mine. Occasionally a swamp, growing an impenetrable mass of vegetation, delayed our progress, and expended my energies in fruitless hacking. The only way to get through many of these "sienegas" was to fall on one's back into the middle of the matted vegetation, and thus compress a place the length of one's self, which those behind trod down. After persevering in this manner for several hundred yards, an inlet would be reached with a soft muddy bottom, and waist-deep from the flood. On the other bank the same mode of progress had to be adopted, until prickly palms and still more prickly creepers made a variety in the difficulty and suffering.

At half-past 6 P.M. we were completely expended, and, seeing no chance of reaching the Etincelle or the canoe that evening, determined to stop for the night. We had been on foot since seven that morning, our legs nearly bare and swollen up with dozens of thorns, our only provision two dozen biscuits, each about the size of a crown piece, and known technically as "crackers," and to crown all we were in great doubt whether the river before us was the

Savannah or not. The maps of the country are so incorrect, and our compasses so useless, that I was not at all sure we might not have been walking in a direction contrary to what we wished, and reached the Chuquanaque, the Rio Inglesias, or some other river whose course has never been correctly laid down. Under any circumstances it was best to economize the few biscuits that remained; so, having had a meal at eleven that morning, we abstained from encroaching upon the store; and, collecting a few branches, lay down with nothing but the canopy of heaven over us.

About 8 o'clock our spirits were raised by seeing the tide rise; wherever we were the sea could not be far off, and had we but one good matcheto a raft would convey us down to it, if all other resources failed. This one good matcheto was unfortunately not in our possession, and the hope of cutting down anything thicker than one's wrist was a fallacy that could not add to our comfort.

Mosquitoes, large ants and sandflies began their tormenting stings before the sun had finally disappeared, and sleep seemed to be out of the question. Necessity is the mother of invention; the thought struck me to button the collar of the flannel blouse over my head, the wrists over my hands, and to smear my trowserless legs with mud. The experi-

ment answered admirably, and although at times partial suffocation disturbed my rest, fatigue overcame discomfort, and daybreak found us considerably refreshed. Two biscuits each, and a little very muddy water was but a scanty preparation for another day's toil, but where delay was starvation, and progress kept pace with uncertainty of locality, hunger was stifled by more solemn thoughts; hope and resignation alone inciting to increased exertions, and keeping fatigue in abeyance.

From 6 to 9½ P.M. we were wading along the river margin, or facing a cluster of prickly stems, sometimes backing through matted vegetation; every step had its difficulty, and every difficulty was attended with additional bodily suffering; but our hearts nearly failed when an interminable mangrove wood extended as far as the eye could reach. The twisted and interlaced roots, some eight feet high, grew out of a bed of slimy mud, left by the tidal waters, making progress a succession of gymnastic feats, in which the gift of balancing had no small share. Hands and feet were equally occupied, and every muscle was called into play: nearly an hour's perseverance had only advanced us a few hundred yards; it was evident such exertions could not be of long duration, so we resolved ourselves into a committee of ways and means. The water was already brackish,

so that there was a certainty of death by thirst if some habitation, or our vessel could not be reached in two days at farthest. The mangrove wood again, extended as far as the eye could reach, and at high tide we must have fraternised with monkeys and parrots in the tree tops.

These were stubborn facts that could not be got over, so it was determined to retrace our steps; to ascend the river until we came to the place the canoe had been left, or until we were perfectly satisfied the river was not the Savannah. In the latter case, the country to the south-west was to be explored for a day, and should the Savannah not be found, we were to return to a place where we had observed a grove of bamboos, construct a raft, and trust to Providence to reach an inhabited part of the coast; under the circumstances, this plan was the wisest we could adopt, for if we were on the Savannah, there was no doubt our skipper would institute a rigorous search; if we were not, what hope could we have of ever being found? If it is painful to let memory recall the feelings by which such considerations were actuated, such a retrospect tends also to raise one's thoughts to higher views of that Divine power, whose very existence almost escapes recollection, until our own helplessness is brought vividly before us. A few weeks before I had read with interest and pity the

fate of the mission to the straits of Magellan. I could now appreciate their sufferings, and enter into their feelings; more than once did the spectre image of their attenuated and lifeless bodies recur to my mind, when hope was driven into a corner among the network of mangrove roots. I cannot say that at any time despair wholly engrossed my thoughts; there was always a conviction on my mind that the problem of an inter-oceanic ship canal was to be solved between Escocés and St. Miguel, and although I am not a disciple of predestination, hope led me to believe I should be instrumental in the solution. When one subject engrosses all one's thoughts, and guides one's actions for several months together, a conviction favourable, or the contrary, is sure to follow. A dreamy hope of success is strengthened by inductive argument; the cause of former failures leads to generalisation of geographical features, founded on geological theories and topographical analogy; such at least was the case with me; and it was this conviction which cheered me on under all difficulties, making suffering but an indispensable appendage to success.

At two o'clock we reached last night's resting place, and remained there nearly an hour; eight hours' constant toil had not been without its effect, and two biscuits each were most acceptable, though washed down by muddy water.

At three, P.M. we resumed our course up the river ; at one place I felt confident I recognised a reach of the Savannah ; the note book was consulted, and the bearings taken, but the course was so tortuous, and the monotony of low wooded banks so puzzling, that no satisfactory conclusion could be come to, and we proceeded on our route more in doubt than ever.

The grove of bamboos was reached about half-past five, and the subject of a raft was again mooted. Our exertions began to tell upon the physique, and I doubted whether with scanty nutriment we should have strength to go into the interior and return again to the bamboos. We pushed on in silence, when suddenly a shout was heard close by, accompanied by the not to be mistaken call, "Is that you?" and we saw our canoe coming down rapidly with the stream. Jim, who had been left in charge, obeyed his instructions, and had waited till near five o'clock for our return. He then started for the Etincelle, and kept shouting all the way down to attract our attention should we be within hearing.

Experience alone can realise the change of feeling this sudden and unlooked for event caused. Some things cannot be described, they must be felt : at such a moment one's thoughts are too rapid, and it is hoped too deeply imbued with thankfulness to Him who ordains all, to allow memory to collect and

transcribe them for parade. Some privacy should never be invaded; imagination must supply what experience denies.

In a few minutes our wet clothes were discarded, and each, wrapped up in a blanket, pursued in silence the train of thought the events of the last two days had engendered. Although the time was one of joy, it was of a serious sort; the past, the present, and the future, brought to mind our sufferings and our hopes, the uppermost of which pictured home and the first hours of bliss in a re-union to all that was dear to us. An agitated state of mind, particularly when brought on by a sudden transition of feeling, cannot calm down to a just appreciation of the present, without allowing imagination full scope in the realms of thought: the future is thus made present with more or less truth; fancy portrays in vivid colours what hope longs for, and a few moments suffice to accumulate the events of years.

It was dark before we reached the Etincelle; after a hasty meal we turned in, to seek that rest which the fatigue and anxiety of the last two days rendered so necessary.

At eight next morning (4th July) the anchor was weighed at ebb-tide. In one place the current carried the schooner under some trees, and for twenty

minutes she was in danger of capsizing. Everything that was loose on deck fell overboard, including our breakfast things, which had just been laid. I wished to examine the Rio Lara, as the Savannah's course is too northerly above the junction, and in crossing to the Calidonia we had found two small streams which joined in the valley, forming, as I at the time suspected, the source of the Lara.

At one o'clock P.M., on the 5th July, the canoe was again in requisition. Provisions for three days, with hammocks and blankets, ourselves and two sailors started with the turn of the flood-tide, proceeding slowly in consequence of the frequent shoals formed by rocky barriers, at which we had to wait until the tide could float the canoe. I wanted to see the river at low-water, as otherwise a correct idea of the engineering difficulties could not be formed.

The banks have much the same character as along the Savannah. A ridge of rock crosses at the mouth, having the same geological features as that forming the falls on the main river. Every reach gets narrower and more tortuous, until, where tidal action ceases, about seven miles up, the stream becomes quite insignificant, twisting about in a bed with a fall of about a foot or eighteen inches a mile; like in the Savannah, these falls are occasioned by pro-

jecting ridges of rock apparently harder than the strata above and below, with still water three and four feet deep between them.

About five miles from the junction there was a rancho, built by Mr. Hassock for his wood-rangers; we took advantage of it to dine in, and about a mile higher up darkness obliged us to stop for the night. The canoe was made fast in mid-stream between two rocks, and, wrapped up in our blankets two and two, slumber soon made us forget the want of feather-beds and four-posters. The night was fine, and until the moon rose the bright constellations of a southern hemisphere reflected against the deep blue sky offered a subject for contemplation, which only those living in the tropics can justly appreciate. I had been reading Humboldt's *Kosmos*, and his poetic descriptions when called to mind, gave additional interest and fresh images to thought. If knowledge is power, the want of it leaves a blank which darkens more and more as fresh scenes and new images are presented. How often I regretted not being a botanist, and having for years neglected geology. The few months I spent at the Durham Observatory, have left but a vague and undefined notion of some of our northern constellations and the general laws which

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guide the motion of all heavenly bodies. I felt quite a stranger to the new and brighter orbs that roused memory in vain to arrange, and recognise them.

There were fortunately no mosquitoes, so that daylight found me refreshed; Forde was feverish, and I persuaded him to remain in the boat, whilst one sailor and I walked a few miles up the river. Ebb tide turned about half past ten, and by an early start I hoped to be back in time, to return with it; it was arranged however that if that was not possible the canoe should wait until night when we could descend by moonlight. I was off before six, and by wading in the river made considerable progress, taking the compass bearings of every reach. The course is very tortuous, with almost every where rock bottom and the banks from 10 to 12 feet high. In two places, bluffs from 25 to 40 feet high, come down to the river edge causing a small fall or rapid, but the general character of the country is that of a plain which had slowly risen, above the influence of inundation, or else formed by denudation, had left every here and there the harder strata, as low steep hills running parallel to each other, but broken through by fluvial action. Where the tide inundated the banks, mangrove trees only grew; as the river became a fresh-water stream, and the banks rose

above flood level, palms, cuipa trees, cedar, mahogany, and the harder woods became more frequent, and of greater scantling, whilst a luxuriant underwood and numerous creepers, mingled their brilliant foliage with the stems and branches of the trees, and gave that charming effect of light and shade which I have more than once referred to, as peculiar to these woods. After walking nearly five miles, I returned to the canoe just in time to save the tide. We had seen the river Lara at low water, now we saw it at high tide; the difference is very striking; from a small stream it swells into a river, in places 200 yards wide, and three fathoms deep. The Etincelle was reached about noon and the anchor weighed at once, so as not to lose the tide. Unfortunately we ran aground on a gravel bank at about half past one, and had to remain there until next morning, for the moon rose too late to take advantage of the night tide. During the afternoon we plotted the course of the Savannah and Lara, with the land journey towards Calidonia. The result was very satisfactory, and confirmed my views about the source of the Calidonia river and the few engineering difficulties to be overcome in, as a friend of mine expressed it, marrying Mr. Atlantic to Miss Pacific.

The morning tide (7th July) brought us to the

mouth of the Savannah, where we anchored; the next day was occupied in surveying Darien Harbour with a pocket sextant.

It is the only time during my sojourn in southern latitudes that the heat of the sun was so oppressive that both Forde and I had to relinquish our occupation. We joined the *Etincelle* in the afternoon at the Boca Chica, having been during the whole day under a cloudless sky, with no covering to protect us. Forde was quite knocked up, and had a feverish threatening—the first symptom of any ailment either of us felt since leaving Europe. An hour before dusk Mr. Hassock came on board: he had heard of our arrival, and was anxious to extend hospitality and afford us any assistance in his power. We had a long conversation about Dr. Cullen. It appears that the first time Dr. Cullen visited Darien, he went with some Americans to seek gold. Dr. Cullen stayed longer than the rest, and lived with Mr. Hassock for several months; during this sojourn Mr. Hassock mentioned more than once what an advantageous line of country there was between St. Miguel and Port Escoces—and an old Indian, who lived in the house, stated, that there was a tradition of the Spaniards having opened a road two fathoms wide, between Forte del Principe and Port Escoces,

and that there were no hills on the road. This Indian had been on the Savannah above Forte del Principe, but neither he nor any one living in the neighbourhood had ever been across to the Atlantic. Some arrangement was made between Dr. Cullen and Mr. Hassock, by which this route should be joint property if Dr. Cullen succeeded on his return to England to form a company.

In about two years Dr. Cullen returned to Chapigana to obtain further information. Mr. Hassock provided him with a canoe, and persuaded the old Indian and his boy to accompany him to the Savannah; they were absent two days, and the Indian said they had ascended the Savannah a little above two ranchos built by Mr. Hassock for his wood-cutters, and had then walked into the interior about two miles, when he got foot-sore; before returning he sent his boy into a tree, and the boy said he could see no hills in the direction of Port Escoces. Mr. Hassock added, that this Indian is very old, and he did not think he could go through woods more than two or three miles.

I was greatly pressed by Mr. Hassock to go with him and examine this Indian myself; his house was fifteen miles off, and I did not consider it of sufficient importance to the undertaking to prove or

disprove statements which I had had a personal opportunity of sifting; besides, I want to keep clear of all party feeling or petty jealousies. A route like the Darien one requires the co-operation and assistance of all local knowledge, and every one affording a little of such information considers himself entitled to a share in the benefit, or at least to have his name associated with the discovery. The difficulty and credit of discovery is not in exploring that part of the country which is already more or less known, has been often visited, and where the natives are ready to afford assistance, but the entry into a country which Indian tribes guard with jealousy; which has not been trod by educated beings for several centuries, and the internal geography of which is represented as a blank, or else filled up wholly from imagination.

Any one who has explored wild tracts of country, knows well the difference between having paddled in a canoe along a river, and carrying one's own provisions and blankets through pathless woods, where every step has to be cleared, and is accompanied by danger from serpents, wild beasts, and inimical tribes of Indians.

Early this morning (9th July) I resumed the survey of the harbour, Forde being too ill to assist.

During my absence Mr. Hassock came on board again (he had passed the night at one of the huts close by, as we had no spare berth to offer him), and retold to Forde the tale of the Darien route.

At half-past ten (A.M.) he took leave, and we set sail for Panama with the ebb-tide in our favour. Two of the sailors were sick, and the cook was useless except at his own work, so that we had to take turns in steering with the skipper. During the night it blew a stiff breeze in our favour, and the morning found us close to the Pearl Islands. A perfect calm and a broiling sun left us at the mercy of the currents during the whole of the 10th; the evening breeze set in dead a-head, but fell again very soon, so that we had only made a few miles on the morning of the 11th. All that day light airs kept shifting from point to point, and the heat was intolerable. Forde had an attack of ague and fever, and shortly after I was on my back with Panama fever. Out of six people four were on the sick list, fortunately the skipper was all right, and he had to manage the vessel alone until we anchored in Panama Bay at 5 o'clock on the morning of the 12th.

Two Californian steamers were just in, and the town was overrun with adventurers. At the Louisiana Hotel we were fortunately able to secure a room to

ourselves, but beyond the room and two stretchers we could procure nothing, not even a cup of coffee or a biscuit. Forde's attacks of fever and ague were intermittent, and he could between times move about a little; I was permanently laid up with aches and pains in every bone in my body, and perfectly helpless. Dr. Le Breton came to see us, and shortly after Mr. Perry, who most kindly got us removed to his house, where every European and tropical luxury, and the greatest possible attention, soon made Forde convalescent, and eventually enabled me to rise from a bed of sickness, which in the Louisiana would have reduced me to a skeleton, and delayed my return to England for a month or more. As it was I did not leave my room until the 20th, when most unexpectedly Dr. Cullen's card was sent up with a note requesting us to call on him. This was impossible, so he came up in the evening. The conversation, of course, turned upon the Darien route, and he told me I had broken through my instructions by leaving Cartagena without him, and required us both to return to St. Miguel with him. This was, of course, declined, and I explained that having done what I was sent out for, and feeling satisfied a ship canal could be made across Darien, I saw no necessity to return; on the contrary, I urged Dr. Cullen to

come to England with us, and as he said he was without cash, offered to advance the passage-money. It appeared in the course of conversation that he arrived in Cartagena a few days after our departure, and towards the end of the month of June hired a small cutter and went to Port Escoces, where he was not allowed to land by the Indians ; he coasted to Navy Bay, and was at every place foiled in his endeavours to get into the interior.

In answer to a direct question from Dr. Cullen, I had to tell him the statements he made as to " his route " had not been verified by me ; on the contrary, many of them had been contradicted by facts : I refused, however, to shew him my plans, or give any detailed information, as my mission was confidential, and I did not consider I was authorised to let any one know more than the general fact of an easy route existing in Darien. Later in the day he called on Mr. Perry for a stamped certificate of my having refused to return with him to St. Miguel.

The next morning (22nd July) at seven o'clock we started for Navy Bay. I was very weak, and did not relish a ride of 23 miles on a mule, with such a road as that to Cruces. Mr. Perry's kindness and hospitality went beyond the threshold of his house,

for our holsters were well supplied with roast chicken and wine, a precaution which experience of roadside fare made us appreciate the more. About six miles from Panama the mule-track biforks, one to Gorgona, the other to Cruces; a dying mule lay just at the meeting, and to avoid it we accidentally took the Gorgona road, and did not find out the mistake for three miles. We had to retrace our steps, losing at least two hours. About six miles from Cruces we overtook our baggage, and shortly after one of the mules fell from exhaustion; it had to be unloaded, and the things it carried left in the wood until morning, when the muleteer promised faithfully to return with a fresh mule and have them in Cruces by nine A.M. I had strong doubts on the subject, but there was no help for it, as the sun had set and darkness was fast approaching. It was after seven (P.M.) when we stopped at the St. Carlos Hotel. All along the road we met soldiers with their wives and children on their way to California. The main body, about 700, had gone by Gorgona, and these were a detachment supposed to be in charge of the baggage, with all the women and children of the regiment. It was a pitiful sight to see women tramping along this most detestable of all bad roads, some of them with children in their arms. I had often

been told "that ladies have no legs," when I committed myself by applying that term to them. I never got a better opportunity of contradicting this assertion. Modesty gave way to necessity; some had most wisely put on trowsers, and discarded the petticoat, but most of them tucked up this feminine garment to above the knee, and tramped along through mud and over rocks with greater spirit than the men.

One question was in every one's mouth—"What vessel is in?" referring to a steamer from California. It was always taken for granted we had just arrived from there;—it was the only known land beyond Panama.

At the place we turned off on to the Gorgona road was a sergeant waiting for his wife—he had come with the main body, and had that morning walked thus far from Panama. On our return to the cross-roads we found the sergeant had gone on, and we overtook him about half way—he begged us to inquire for his wife, as he feared she had stayed behind to nurse some sick people; it appeared that she had no children of her own, but was so charitably inclined she was always looking after other people when in trouble. This proved to be the case, for she was at Cruces nursing a sick sergeant who had

a wife and several children—the poor man died during the night, for about five in the morning we heard the following conversation in the next room to ours :—

“ I have to report Sergeant B—— is dead.” “ Very well ; have you arranged about his funeral ?” “ No, sir.” “ Then go to the priest, and request him to bury him at once.”

We saw our friend the sergeant, who is such an exemplary husband, start back with his wife, each on a mule. I gave him my spurs to assist him in his journey. After some bargaining Forde hired a boat to take us to the railway. We started about ten A.M., got into the train at two P.M., and reached the Exchange Hotel at Navy Bay about five in the evening.

The new town that is rising rapidly into existence has been named “Aspinwall,” after the principal shareholder, and, I believe, the originator of the railway scheme. The houses are all of wood and built on piles, the first floor being raised about three feet over the ground. All the building material has come from the States ; the price of labour, difficulty of access, and want of time to season it, rendering the use of native timber too expensive. We called on Mr. Totten, the engineer to the railway, one of

the few whites whose constitution has not materially suffered from the pestilential atmosphere. His house is situated on the sea-beach, in an airy situation; it was quite a luxury to sit there and enjoy the cool sea-breeze after the abominations of the Exchange Hotel, where every one was ill,—cleanliness, attendance, or comfort, being permanent strangers within the walls. I was amused at a notice stuck up in the dining-room—"Gentlemen dining at the first table are requested to keep their coats on:" the hint was very necessary from the specimens we saw at the table d'hôte. In the passage was a basin at one end, and a jack-towel at the other (at least 50 feet apart). In the middle a small looking-glass, with a hair-brush and tooth-brush chained alongside. I must draw a veil over the bed-room furniture; we both slept, or rather lay down, in our clothes, waging war against mosquitoes, notwithstanding curtains intended to keep them out. I never saw such large samples of these torments; they looked like dwarf harry-longlegs; nor did they waste time by a buzzing examination of your person before deciding which part to attack, but flew direct to the choice morsel, leaving a mark as large as a fourpenny bit. A fatiguing journey and a sleepless night had not recruited my strength, and I was perfectly helpless

in collecting our baggage on the wharf to wait for the Trent steamer, which was to call that evening. She rounded Chagres Point about six o'clock, and shortly after seven we were steaming towards England. This vessel had been four consecutive voyages to the Main, the consequence was 25 out of a crew of 50 were sick ; four had been buried within ten days, and before reaching St. Thomas we had three funerals, two passengers and one sailor, all having died of Chagres fever. Forde got a return of ague and fever, though in a mitigated form ; I looked like a walking ghost, but my appetite had returned ; good English mutton soon made a change, and no stall-fed throve more rapidly.

We arrived at Cartagena on the 26th ; Forde found letters ; as usual I was minus any. My Report on the Dique Navigation had been published, and the Provincial Government were ready to grant liberal terms to a Company undertaking its completion. There can be no doubt it is a good speculation, and in conjunction with a line of steamers on the Magdalena, must pay a handsome interest.

We bade adieu to our friends, and at 2 p.m. were steaming against the trade-wind, which blew most pertinaciously right in our teeth, the whole way to St. Thomas. A little squeamishness did not prevent

an inordinate amount of eating and sleeping, with discussions on the dissolution of Parliament, and the coming elections. It was most satisfactorily arranged that the Derby Cabinet were never to mention free trade, but having established themselves on a well oiled universal joint, turn with popular opinion and bend to circumstances, but keep firm root in the productive soil of place. The Irish party were to have a sop by advances for railways, perhaps a packet station, with the understanding that the mention of Maynooth was treason; any very troublesome M.P. was to be sent as Consul to China or the Antipodes. The only decided act was to be a prohibitory duty on slave grown sugar. It would save the character of Ministers as Protectionists, satisfy Financial Reformers and Anti-Slavery spouters about the African Squadron, and save West Indian planters from utter ruin. If Spain and Brazil grumble, what matter? Louis Philippe is no longer alive and able to take cause with the former, and intestine quarrels keep the latter fully occupied at home.

Anchored at St. Thomas on the morning of the 31st. The forenoon was fully occupied by a warm bath, a large piece of soap, two ices and a sherry-cobbler, all of which added to the comfort of the

outward and inner man. We made an investment of a case of Eau de Cologne, hoping to get it into England duty free. On opening a bottle for use it was found to be such abominable stuff, that Forde insisted on having it kept closely corked, if not thrown away.

The Great Western came in from the Windward Islands with forty-five passengers for England, the Magdalena, from Jamaica, with a score, and we had about the same number. Some joined from St. Thomas, so that the total was nearly 100. The Magdalena is one of the new steamers, this being only her second trip. She is the same size as the ill-fated Amazon; she had 1160 tons of coal on board, which sank her so deep in the water, that the paddles were immersed twelve feet. The floats are made to feather, but being calculated for an immersion of eight feet, act as a stop instead of an assistance. I never saw such enormous wheels—they say that each wheel and its paddle-box weighs 100 tons, and have completely disappointed their projectors. As yet (7th of August), eight and a half knots has been the maximum speed attained, with some assistance from sails, although the builders promised an average rate of ten knots, at least. Had such a failure occurred in her Majesty's navy the papers would have revelled in abuse, and Hon.

M.P.'s who know more of a spinning jenny than a steam engine, would have asked questions to which the Secretary to the Admiralty would have given evasive answers—but a Board of Directors are never responsible—they can only be asked questions twice a year, and that by shareholders, who know less than themselves, so that there are always several months to cook an excuse or patch up an improvement.

Steam navigation in long voyages is almost at a stand, in consequence of the want of room to stow away a sufficient quantity of coal. In full work the "Magdalena" burns eighty tons a day; I am told the "Parana" could use with advantage 120 tons in twenty-four hours. The engines are from 800 to 900 horse power, constructed with the newest improvements, and ought by proper arrangements to propel a vessel of this size twelve or thirteen knots an hour, under ordinary circumstances. There are several reasons why they do not. 1st. The immersion from the great quantity of coal on board. 2ndly. Heavy paddle-wheels not adapted to the beam of the vessel, or the use they are intended for. 3rdly. The fear of running short of coal prevents the working of the engines on the first grade or full power, so that the maximum speed is seldom

attained. Putting aside the ill-constructed wheels, a mechanical error which experience will correct, the whole difficulty resolves itself into a sufficiency of coal. What measures have the Company taken to economise fuel? None. If they would only look to Cornwall and study the history of steam as used there, a most perfect example is offered how the same difficulty was got over. There, the high price of coal caused by long carriage, made the working of the mines that required steam power a losing speculation. Their steam was worked at low pressure (six to twelve lbs. per square inch), and expansively, the condensing process being used to form a vacuum. As the relations between heat and pressure became more known, and experience had shewn that the ratio of increase was not direct, but depended upon certain laws which allowed of a maximum and minimum in either; or in other words, that at a certain pressure the consumption of a particular class of fuel was reduced to a minimum, this knowledge was applied, and instead of working with steam of nine lbs. on the square inch, the pressure has been raised to twenty-five lbs. and thirty lbs.; the same mechanical appliances for condensation and expansion being still in use. The consequence has been a saving of more than half in the quantity of coal necessary to

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create a horse power. Oh! but say the old women, this is high pressure and look what shocking accidents occur in America from using this system. Not *using* this system but *abusing* it. A coupè close behind a locomotive hissing with the same explosive power at 90 lbs. and even 120 lbs. pressure creates no alarm! Who ever heard of a locomotive boiler bursting and killing all near it? Yet the generation and application of steam in a locomotive and a marine engine varies only in the arrangement of the mechanical parts. It is true salt water wears out a boiler much quicker than fresh; that is an expence, but with proper attention should not add to the danger in the proportion of twenty-five to ninety.

The application of a *moderate pressure* in steam navigation has been hitherto prevented by false notions of danger which Yankee foolhardiness has fostered. I remember a case of explosion in which Mr. Fairbairn was called in by the Crown to give evidence as to the cause, and where the blame lay; during his examination, or, I rather think, in a written report, he expressed his opinion "that well constructed boilers with a moderate degree of attention, working at 25 to 35 lbs. per square inch, are just as safe as the boilers ordinarily made for 6 to 9 lbs." All practical men know this to be the

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case; but engine makers do not contract to supply the coal burned, and Boards of Directors, in their ignorance, think they consult public safety and their own interests by following in the beaten track. These prejudices must be got over; our distant colonies, as well as foreign commerce, require a rapid inter-communication, and as it is only a difficulty that calls into action new views and improved means, it cannot be long before economy in coal is obtained by the legitimate use of a power so variously and extensively applied to the progress of civilization and the development of hidden wealth.

We landed at Southampton on the 17th of August, having been absent four and a half months.

DARIEN
SHIP NAVIGATION.

ENGINEER'S REPORT.



IN December, 1851, our attention was called by Dr. Cullen to the Isthmus of Darien, when from his statements and other information we were led to believe a favourable line of country existed for the formation of an inter-oceanic navigation.

Mr. Lionel Gisborne with his assistant, Mr. H. C. Forde, Civil Engineers, were dispatched by us in April last to undertake the examination of this Isthmus, and hereto appended is the report of their investigations.

The New Grenadian Government has since granted us a concession of land and privileges necessary for the construction of an inter-oceanic communication.

In submitting this report to the public, we confidently recommend the adoption of that navigation which will, without locks, at all times permit the passage of the largest vessels.

CHARLES FOX,
JOHN HENDERSON,
THOMAS BRASSEY.

London,
Sept. 10, 1852.

DARIEN SHIP NAVIGATION.

TO MESSRS. FOX, HENDERSON, AND BRASSEY.

GENTLEMEN,

HAVING made arrangements with Sir Charles Fox to ascertain the practicability of an inter-oceanic navigation for the largest ships, at all times of the tide, across the Isthmus of Darien, between Port Escoces on the Atlantic and San Miguel on the Pacific, and having made such preparations as I could in this country, I sailed with my assistant, Mr. Henry C. Forde, on the 2nd of April last, from Southampton to Cartagena, where we arrived on the 1st of May. Here we completed our arrangements, chartered the schooner *Veloz*, sailed for Port Escoces on the 12th of June, and anchored in that port on the 15th.

At Cartagena we obtained information which fully confirmed what we had been led to expect from the little we gathered before leaving England ;—that no

strangers had been allowed to visit the interior since the Buccancers assisted the natives in repelling the Spaniards nearly two hundred years ago; that it was in vain to think of obtaining from these jealous savages permission to enter their territory, and that to do so without their permission was hazardous in the extreme. Yet as it was generally supposed that the summit level between the two oceans was near the Atlantic coast, and it was, therefore, important to ascertain whether that was the fact, we determined to make the attempt. From the schooner the Cordilleras appeared to run in an unbroken range. We landed on the morning of the 17th of June, and crossed this range without any obstacle, ascertaining the lowest point visible from the seaboard to be 276 feet high.

Beyond this point we followed a small stream, which led us to a larger river flowing from the S.W., in a semi-circular sweep towards the north. A flat plain extended to the S.W. in the direction of the Gulf of San Miguel, as far as the eye could reach; looking over the tops of the trees from a bluff about 100 feet high, which we ascended for the purpose, we obtained an uninterrupted view for at least six miles in that direction. The ranges of hills seen are shewn in red in Map No. 1.

We followed the course of this river to the north until dark. Early on the following morning two Indians in a canoe came in sight, who, upon perceiving us, instantly landed and fled to the woods. Proceeding on our journey we met, a few hours afterwards, a woman and two children (one an Albino), from whom we were unable to derive any information. We had scarcely passed her when a canoe suddenly appeared with five well armed Indians in it, who made us understand that we were to follow them, which we thought it prudent to do.

They led us, fortunately, along the course of the river, which gradually assumed a more easterly direction, winding among the hills that overlapped each other, until we reached a village at its mouth in Calidonia Bay. We were thus singularly assisted in our object by the discovery of a passage through the range of the Cordilleras, which had been heretofore supposed to be unbroken. Here an Indian, who spoke a little English, and seemed a principal man in his tribe, questioned us as to our object in entering their territory. Thereupon a meeting was held of the chief men, who detained us as prisoners. After several hours, and with great difficulty, we prevailed on them to allow us to return to our vessel,

on the condition, however, that we should set sail instantly, and upon the understanding if we were again caught in the interior, more summary measures would be adopted. Five or six Indians accompanied us to Port Escoces, about five miles off (where our vessel was lying), and they remained until the afternoon, when we were well clear of the coast.

Our great object had, however, been obtained in finding that the Cordilleras, which appeared from the sea a continuous range, had an intervening valley, and that the summit between the two oceans must be in the centre of the Isthmus, if not nearer the Pacific coast.

It had also been ascertained that Port Escoces, though rather small for the terminus of a great ship navigation, would make an excellent harbour of refuge, and that Calidonia Bay, as far as I had an opportunity to examine it, was most admirably calculated to serve the purposes of a harbour to the contemplated undertaking.

We now sailed for Navy Bay, and thence crossed the Isthmus to Panama, where we arrived on the 25th June. Here we hired a small schooner of twelve tons burden, sailed on the 27th for the Gulf of San Miguel, and arrived in the night of the 29th at Bocca Chica,—the entrance of Darien harbour.

We proceeded on the following day to the examination of the Savannah river. At its mouth we found it two miles wide, narrowing for seven miles above to a width of half a mile, and skirted by hills from two to three hundred feet high, running within a mile or two of its banks. The depth of the river varies from nine to six fathoms at low water; and soundings gave us a soft muddy bottom. From this point to the junction with the river Lara, the depth diminishes till the bottom becomes level with mid-tide. The tide rises for five miles further up the Savannah to a fall of about two feet over a stratum of rock crossing the stream diagonally N.E. by E. at a dip of 60° . The point marked I. on the accompanying Map shews how far we were able to ascend in a canoe. The same class of rock appears both at the bottom and the sides. The course of the Savannah beyond tidal influence is tortuous, the width of water way being sixty feet at I.

On the morning of the 2nd of July we began our land journey to the N.E. in the direction of Calidonia Bay. For the first two miles the country was level and less overgrown than on the Atlantic side, which made our progress comparatively rapid.

We then crossed a range of hills which we ascertained to be 100 feet high. After passing a valley

in which was the confluence of two small streams, we crossed a second range of 130 feet high, forming the summit between the Savannah and Calidonia Rivers; at the foot a stream flowed nearly due east. We followed it for two miles, which led us to a larger one, the course of which we traced to the point marked D on the map. At this point a clear view to the N.E. in the direction of the point marked E, towards Calidonia Bay, shewed a flat plain with no intervening hills. The points D and E being only six miles apart, our view from D towards E, and our still more commanding view, for at least six miles from an elevation of 100 feet at E in the direction of D, overlapped and were perfectly conclusive with regard to the few miles seen and not actually walked over. We therefore accepted the admonition of a foot path and a bridge formed by the trunk of a tree placed across the river at this point, that we were again in the territory of the Indians into whose hands we had fallen at Calidonia Bay, and that our object being accomplished, it was unwise to incur further risk from the Indians by walking over these six miles, thinking it best for the success of the undertaking to retrace our steps at once.

On mapping our route, I found that the point I. was too high up the Savannah river for the shortest

junction between it and the Calidonia. We therefore ascended the river Lara, which ran in a more easterly direction; the tide carried us up six miles, the width narrowing from 300 feet to 30 feet; some falls of a few inches each are caused by a rock of the same character as that of the Savannah; its course is very tortuous; for the five miles I examined beyond tidal action the bottom was uniformly rock, and it became an insignificant stream. After mapping the direction, I feel confident that its source is the confluence of the small streams found in the valley between the two ranges of hills previously mentioned.

The gravel banks in the Savannah and Lara rivers are composed of the detritus of igneous and stratified rock. The latter is the same as that forming the falls on both rivers; its dip being from 60° to near 90°, and its strike varying from N.E. to S.E.

The general character of the country is that of a flat plain, subject to inundation at high tides for a considerable distance out, and covered with mangrove wood, whose high interlacing roots growing out of soft mud, render walking impossible. Beyond tidal influence the banks rise five to ten feet above ordinary water level, and are covered with the finest timber I have seen on the Isthmus—cedar, mahogany, ebony, lignum vitæ, cuipa, palms, and other trees.

On the 9th July we returned to San Miguel. This bay is naturally divided by a promontory and a chain of islands, into a roadstead and a magnificent harbour. Captain Kellett's unpublished chart, supplied by the Admiralty, shews only a part of the former. I have made a survey of the remainder, and the general features are represented on the accompanying maps, as also those of Darien Harbour. I did not examine Bocca Grande, as I understood from the natives that the navigation through it is rendered dangerous by rocks, and as Bocca Chica, on account of its depth and position, is far more advantageous.

I do not think it is possible to exaggerate the merits of this part of the Isthmus as the terminus of a great ship navigation; it requires but an examination of the map to be convinced of this fact.

We returned to Navy Bay, and sailed for England on the 24th July, where we arrived on the 17th inst.

On Map No. 1, I have shewn in red colour the topographical facts which have been ascertained by personal investigation, with sections of the portions traversed. From this it will be collected that the harbours of San Miguel and Calidonia are both excellent as the termini of a ship navigation on the

largest scale, with Port Escoces as a harbour of refuge should circumstances occur to render its use necessary; that the Savannah river has six fathoms or upwards in depth at low water, for a distance of seven miles from its mouth, the effect of the tide reaching up the Lara tributary eleven miles above this, or eighteen miles from Darien Harbour, leaving a distance of thirty miles to Calidonia Bay, *which is the actual breadth of the Isthmus between the tidal effect of the two oceans*; that the summit level is ascertained to be 150 feet, and is formed by a narrow range of hills, having a gradually rising plain at their foot on each side. There is every reason to believe that a more detailed examination of this division of waters will result in a considerably lower summit being found; but this under the circumstances of the section is not such an important point as might at first be supposed; the narrowness of the ridge making the cubic quantity through it very small compared to the excavation through the plains, so that should the hills depress into the actual level of the plains, the estimate will not be materially affected. The bulk of the work to be done is in the plains themselves, and the cost will be proportionate to the cross section adopted, or, in other words, the depth and breadth of the navigation

required. The question, therefore, resolves itself into what are the necessities of commerce as to an inter-oceanic water communication.

I do not consider it necessary to enter into the merits of this question. My instructions are to design a navigation capable of passing with security at all times the largest vessels navigating the two oceans, not with a view to a local coasting trade, but for the accommodation of the whole maritime world.

There are two methods of accomplishing this object :—

1st. To make a cut of sufficient capacity to form an uninterrupted navigation (without locks) from sea to sea.


2nd. A navigation with locks on a scale suitable to the object in view.

There can be no doubt that the carrying out of the first proposition will comply in the fullest sense with the requirements of all classes of vessels, and, when completed, will best supply the want of a natural connexion between the oceans. Its execution offers no engineering difficulties, and no chance of future failure ; it is simply a question of cubic quantity of excavation dependent on the dimensions of the cross section.

Many large merchantmen and men-of-war draw from 24 to 28 feet of water, and oceanic steamers measure 350 feet over all, with a breadth of 70 to 74 feet across the paddle boxes. Ship building is not at a stand, on the contrary, the size of vessels is rapidly on the increase; in such an undertaking it is therefore reasonable to forestall progress by a timely concession to it. I propose to make a cut 30 feet deep at low tide, 140 feet broad at bottom, and 160 feet at low water's surface. Such a cut carried from sea to sea is not larger than the trade of the world requires, and will form a permanent, safe and rapid mode of transit.

On Plan No. 2, the direction of the navigation is marked by a red line, and on the section the depth of cutting required is shewn in red colour.

On the Pacific the tide rises twenty-three feet and on the Atlantic it is scarcely appreciable. Mid-tide is on a level, or nearly so, in the two oceans, so that there will be a current both ways dependent on the ebb and flow of the Pacific. This current will not exceed three miles an hour, and will act most beneficially not only as a scour to prevent deposit but as an assistance in the transit of vessels. It will secure the passage being effected in one tide, and prevent the passing of vessels going different



ways, as the direction of the trade will be influenced by the ebb or flow of the Pacific tide. The material to be excavated through is chiefly rock (not expensive to quarry) so that this current will not wear away the banks, nor will the wash of passing steamers cause injury; it also affords security against any interruption to the navigation from slips and reduces the cost of maintenance to a nominal sum. This rock is a stratified shale with thinnish beds, easy to get, though sound, and will form an admirable side lining to the navigation, dispensing with the necessity of any artificial protection. The fact of its existence is one of the most favourable features to the undertaking as regards permanence and certainty of success.

I estimate the cost of this design at £12,000,000. It must be remembered that no project has ever been before the public which embraces anything like the objects attained by such an uninterrupted navigation. All other propositions have but local importance and look to their profits from local trade, this one is adapted to every ship afloat, and seeks a return from the trade of every country. Its completion will make a change in the carrying commerce of every Pacific port, and as a railway makes its own traffic, so will this work, most certainly,

greatly increase the commerce between the distantly separated countries which steam power is only now beginning to reach.

This is the design, which after mature consideration, I confidently recommend for adoption, and it is almost with regret that I feel it my duty to submit any other, so sure am I that it is the only one which will satisfy the requirements of commerce.

My second proposition necessitates two levels joined by a series of locks.

I adhere to the cross section of cut recommended in the previous design, as well as the fact of the navigation being open to the largest vessels at all times of the tide.

A tidal canal, supplied on the upper level at high water, would be a very imperfect navigation, and one-third more expensive than the design I am about to submit. I estimate the cost at about £7,000,000. It would involve all the disadvantages of a canal, and offer many obstacles to be guarded against, such as the arrangements for draining the country on each side, without the risk of strong currents and shoals formed by deposit, and increase the time of transit considerably, by the small speed attainable by steamers in such a class of navigation. I cannot recommend it for the purposes intended.

It has been before mentioned that the Savannah and Calidonia rivers run into two extensive plains. They are uninhabited, and the land is uncultivated. It grows, however, fine timber, which, if means of transit were at hand, would be of considerable value. During the dry season, neither of these rivers could, near their source, supply the water required at a summit level of a navigation on the scale contemplated: during the wet season, again, they discharge a large volume of water which, in an ordinary canal, would cause trouble and expense to regulate, and prevent accumulations of deposit. Under these circumstances, I propose placing an embankment across both these rivers at the points marked in red on Map No. 3, making the embankments long enough and high enough to raise the water at their back 90 feet above low tide in the Pacific. This will flood both plains up to the range of hills which forms the boundary of their catchwater basins. Through the summit a cut is to be made of the same cross section recommended in Design No. 1, but with 40 feet depth of water, so as to allow 10 feet to be drawn off the lake for lockage, or a rise of 10 feet to catch flood waters, and prevent too rapid a current in the tidal entrances to the harbours. All the valuable timber in the lake must be cut previous

to the water being let in, so that an easy means will be afforded to convey it to the harbours for shipment. From Calidonia Bay to the embankment, a cut will have to be made of the cross section adopted in the other design. The Savannah is navigable up to the point where the embankment is to cross.

The rise of 90 feet will have to be overcome by locks placed in the side of one of the ranges of hills against which the embankments terminate, and which are composed of rock; weirs will also be provided to discharge surplus waters.

It is a serious undertaking to raise a large vessel 90 feet, without much loss of time.

I am fully prepared to meet this difficulty, and propose that the locks should be 400 feet long from mitre to mitre, and 90 feet wide between the gate quoins. Each lock to have a lift of 30 feet, to be overcome by wrought iron gates. The large supply at the summit level does away with the usual objection to a high lift wasting water. There will be no difficulty in constructing the locks and gates of the dimensions proposed, stone, lime, and sand of excellent quality, are obtainable in more than one place on the line of country to be traversed.

Three locks will thus be required in each embankment, and I have estimated for two sets at each

end : the second set to be 300 feet long and 50 feet wide, with 22 feet of water on their cills. Thus four vessels can be passed into the lake at the same time, and the larger locks only used for those adapted to their size.

For a navigation requiring the use of locks, I can submit this design with confidence. It possesses the facilities of deep still water lake navigation, without the disadvantages attendant on the use of a canal. The concentration of lockage in two places will save time. Great facility is also offered in the execution of the work by its not being spread over a large area and only a small portion of it below tidal level. The estimated cost is £4,500,000, it is only about one third of that set down for an uninterrupted cut from sea to sea, but the disadvantages are very great; locks are decidedly objectionable in an undertaking of this magnitude and mercantile value. The best studied plans carried out in the most perfect manner cannot guard against accident or neglect, which may stop the whole transit for months. Delay and risk there must be when such large machinery is worked, and there is no doubt shipowners would sooner pay a higher toll to pass directly from sea to sea, than run the risk and incur the delay of lock navigation.

This question is not one on which a hasty opinion

should be formed, nor must the decision be biassed by the disparity in the cost of the two measures. The real point is, which is of the greatest value to the mercantile community? a far-seeing thinker cannot doubt that the level cut is the only one which will comply with the requirements of the world.

In framing the estimates I have calculated wholly on imported labour, making a liberal allowance for the diminution of work to be expected in a tropical climate and the extra wages necessary to induce parties to emigrate. This portion of the Isthmus of Darien is without doubt in one of the most healthy districts. Neither Mr. Forde nor I suffered in the least from the climate until our return to Panama, notwithstanding we were often for days together in the same wet clothes without a blanket to cover us at night and living on bad provisions.

The reason of this comparative salubrity is the absence of swamps or overflowings of the river banks out of the range of the tide, and the general dry character of the surrounding district.

I have purposely abstained from entering into any detail of the works contemplated, or the arrangements for carrying them out. My object has been to give a concise view of the facilities of the Darien route, the facts elicited by the examination of the

country by Mr. Forde and myself, and the best means of carrying out a project which has for centuries occupied the attention of Governments and mercantile men without much advance towards its completion; I cannot conclude, however, without again earnestly recommending for adoption that design *which will, without locks, at all times, permit the passage of the largest vessel.*

I remain, Gentlemen,

Your obedient servant,

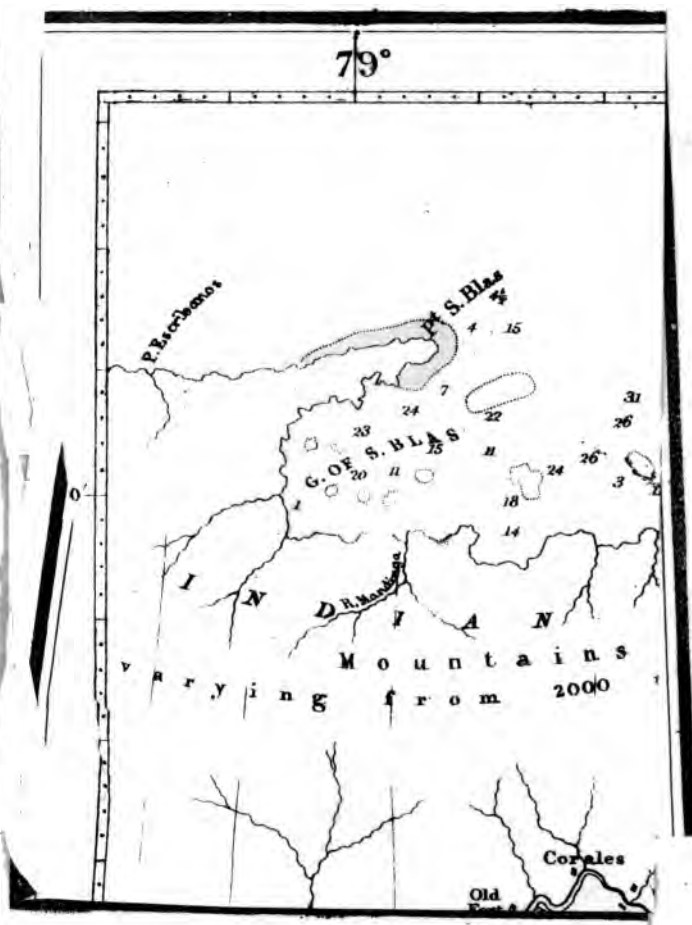
LIONEL GISBORNE, C. E.

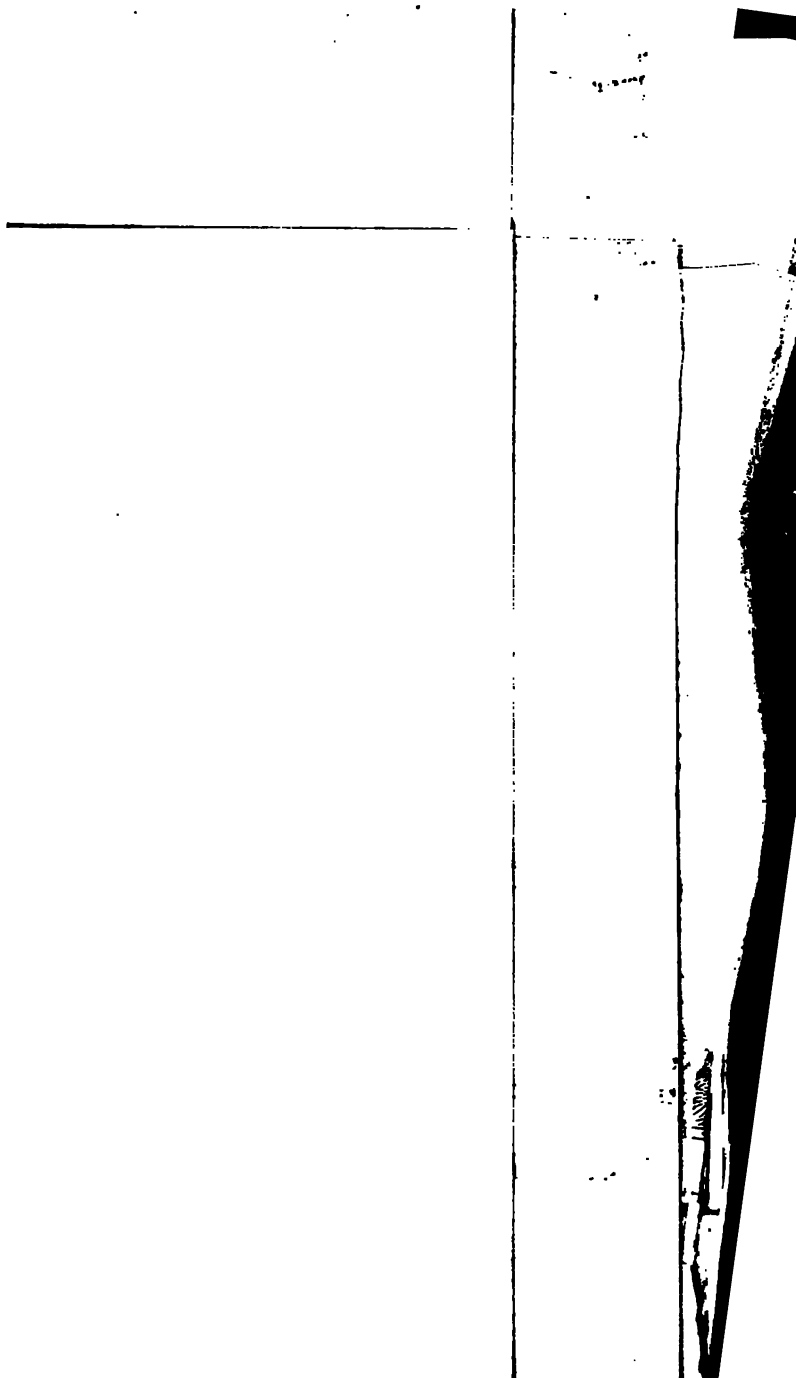
41, Craven-street, Strand,
London, 28th August, 1852.





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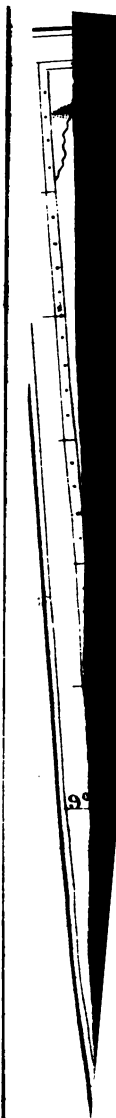


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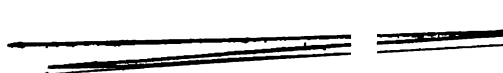
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